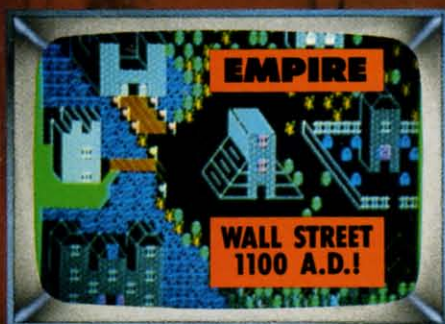


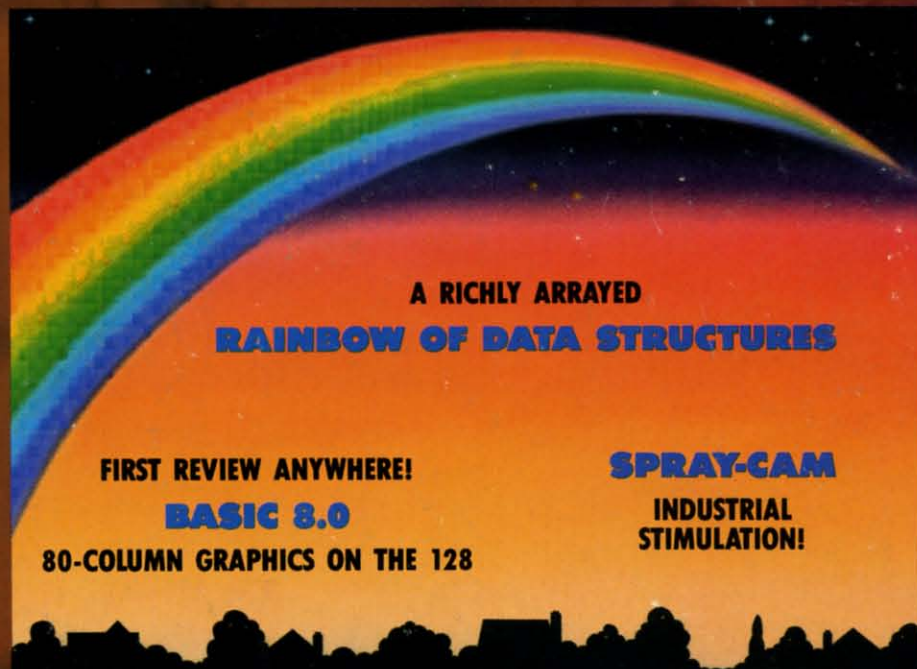
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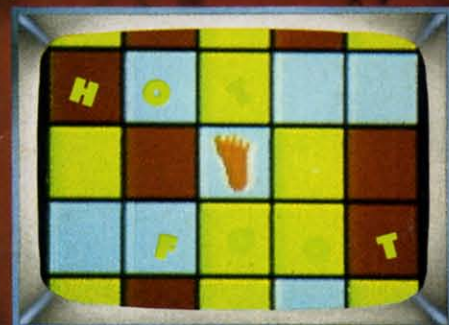


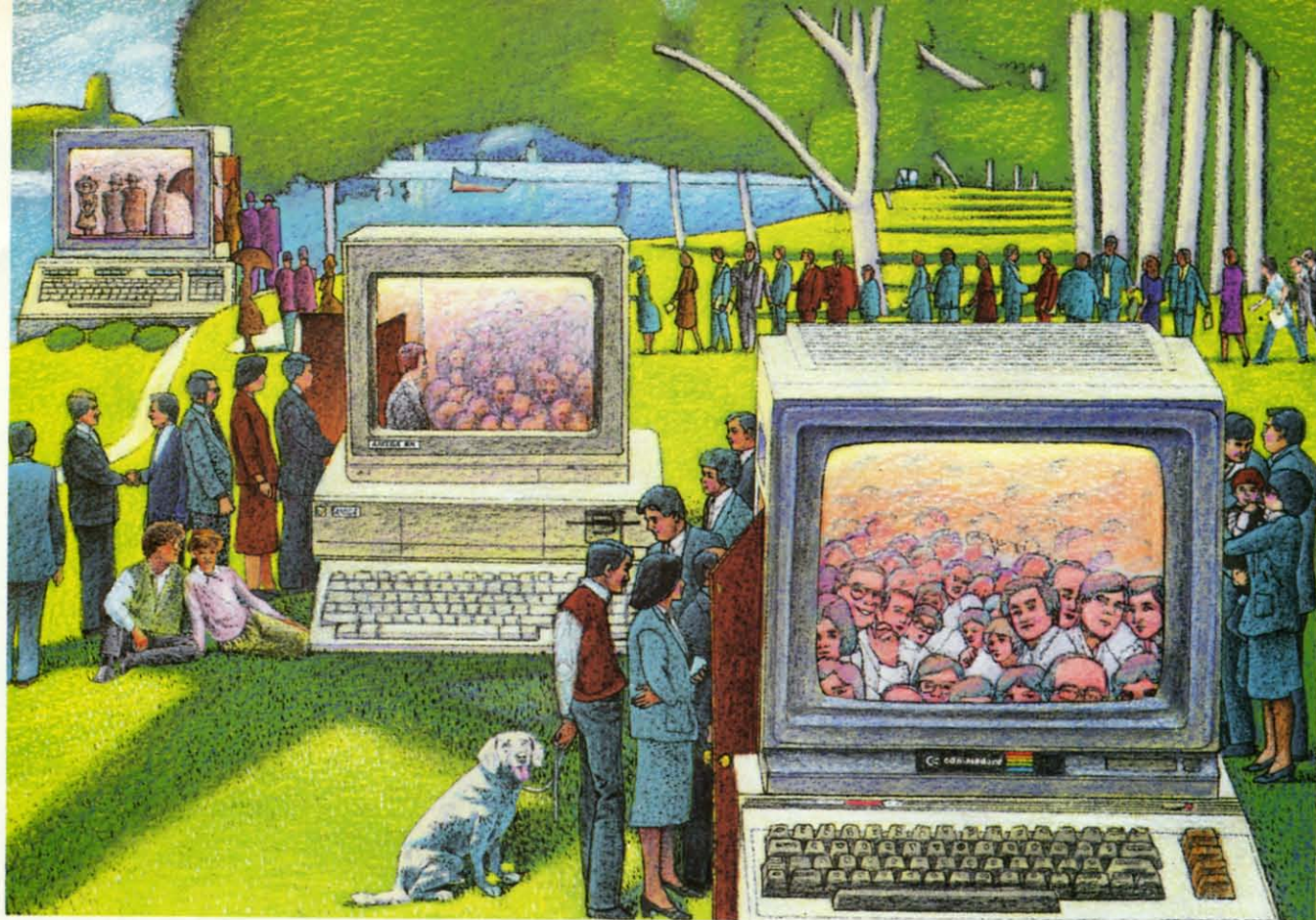
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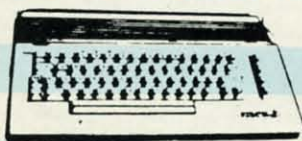
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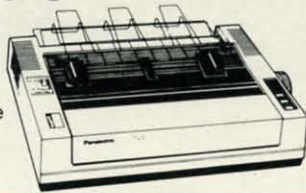
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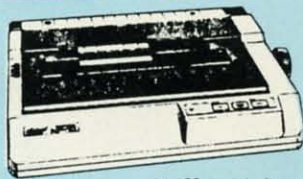
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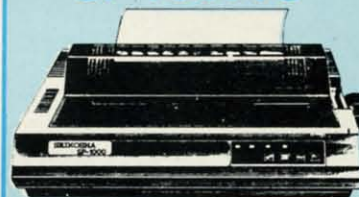


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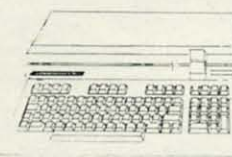
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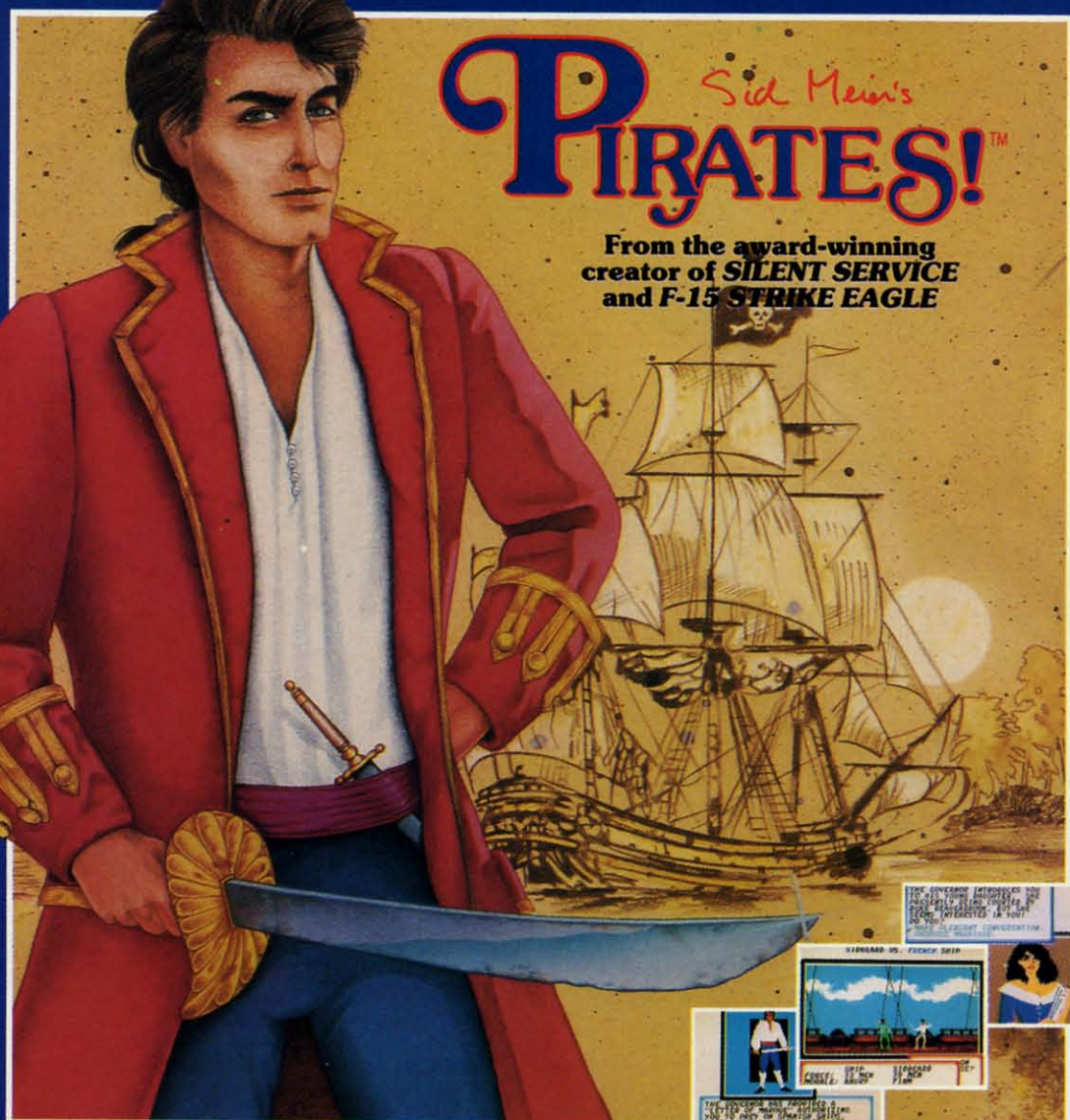
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VIEW FROM THE BRIDGE

However unintentionally, the roster of names on the *Ahoy!* contents page is a little deceiving. Some of those listed divide their time between *Ahoy!* and other magazines published by this company; some are freelancers who work at home. As far as editors in particular are concerned, we identify no fewer than ten individuals as one sort of editor or another, but those who do the job on a daily basis number only three: Michael R. Davila, Tim Little, and the undersigned. That is, until this week, when Senior Editor Tim Little accepted a lucrative offer to join Electronic Arts' programming department.

We hate to see Tim go, but are grateful for his nearly two years of dedicated service. We're sure the many of you Tim has assisted on the *Ahoy!* hotline and through the mail will echo those words. Our loss is EA's gain. There's not an ounce of resentment behind these tears in our eyes—only pride!

Now let's get on to something really important—the October issue of *Ahoy!*

- Cleve Blakemore probably didn't say, "I'm going to create a cult classic" when he sat down to program *Vault of Terror* and *Dark Fortress*—but that's the way it turned out. To this day, we receive more mail on those two games than on most new ones published in any given month. We don't think this will be one of those months, however—because Cleve has gone to the gold mine one more time! You may never play "Monopoly" again after getting caught up in the mercantile madness of *Empire*. Money can make people crazy, you know—crazy enough to turn their backs on their colleagues when a better offer comes along. (Turn to page 47.)

- Though he's not the type of guy to use *Ahoy!* as a platform to bigger and better things, Tony Brantner contributes *Platforms* this month. We no longer feel the need to boast about Tony's graphics—go and see for yourself! (Turn to page 16.)

- John Krutch gives you a *Hotfoot* as you traverse a constantly changing grid of squares ranging in temperature from soothing to sizzling. Those of you who have been burned, as we have, can surely relate. (Turn to page 38.)

- It's worthy of note that while Dale Rupert could have stabbed us in the back years ago and gone over to *Byte* or somewhere, he's still with us, contributing his 46th *Rupert Report* to this, the 46th issue of *Ahoy!* His explanation of arrays and linked lists is like the pot of gold at the end of *A Rainbow of Data Structures*. (Turn to page 20.)

- We love welcoming new people to these pages—especially since you never know when someone you depend on will leave you flat. Anthony Bertram breaks in in a big way with *C-64 RAMDrive*, which simulates a RAM disk and lets the user try some of its features. (Turn to page 36.)

- Ever been in a jam? We sure are, with work piling up around here and not enough editors to handle it. But Buck Childress' *Jam Attack* defends you from a different type of jam—the one that results from trying to save a program that's too large for the disk space available. (Turn to page 34.)

- Remember the days when the Protestant work ethic still held sway—when the opportunity to do a good job for a company that took care of you meant more than a big raise you could get by jumping ship? Bob Blackmer gives us a little taste of what those days were like in *Spray-Cam*, where you labor to repair the exhaust tanks in an industrial complex. (Turn to page 18.)

- Rarely does a review rate specific mention on this page, but Morton Kevelson's extensive evaluation of BASIC 8.0 is a true "first." Naturally, when Morton procured an advance copy, he offered the review to us—not some other magazine that outbid us. (Turn to page 63.)

You'll find much more inside than we can go into here. We'd rather use the space remaining to serve notice that we are, in all seriousness, looking to fill the vacant editorial position here at *Ahoy!* If you live within commuting distance of Manhattan (if you have to ask, "where's Manhattan?", forget it) and possess Commodore expertise and language skills, you're our boy (or girl). Call us or send a resume.

And to Tim Little, who we're certain is stretched out in San Mateo with his suntan lotion in one hand and his joystick in the other: onward and upward! Things will never be the same around here. Little does Electronic Arts suspect that the same is soon to be true for them! —David Allikas



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Nimbus (\$149.00) eliminates some of the drudgery involved in small business cash management with predefined reports, an editable chart of accounts, and a single entry method. The program's multitasking capabilities give it constant access to the General Ledger, Accounts Payable, and Accounts Receivable sections; data entry in any of the three causes the other two to be automatically updated. Written in C, *Nimbus* allows over 450K of company data to be entered on a single disk.

The *MaxiPlan* spreadsheet has been released in two new versions: *MaxiPlan 500* (\$149), optimized for a 512K environment, and *MaxiPlan Plus* (\$199), with new macros, faster recalculation speed, and a print spooler. Both versions offer X-Y (scatter), 3-D pie, 3-D bar, exploding pie, step, and hi-low chart styles.

Oxix Inc., 714-999-6710 (see address list, page 14).

GET A GRIP

Handle 128 (\$19.95) gives the user exactly that on some of the computer's functions, through the Terminal Setup Menu (display and set the time, choose console color scheme, select terminal parameters), the Sequential File Utili-



The IconTroller mounts on the side of your 64 or 128. A feed-through jack makes use of another input device possible. READER SERVICE NO. 276

ty Menu (scratch, rename, copy, append, verify BAM, format, collect), and the Sequential File Transfer Menu (choose I/O devices for creating or transferring files). A 30 day unconditional guarantee is included.

Solomon Software Systems (see address list, page 14).

ART PROGRAM

The *Advanced OCP Art Studio* (\$39.95), a hi-res drawing package that allows the C-64 artist to modify color attributes, incorporates windows, icons, pull-down menus, and pointing devices. Provided are 16 pens, 8 random strays, and 16 user-definable brushes, plus 3 magnification levels with pan and zoom, pixel clear, and plot functions. Windows can be inverted, cut-and-pasted, enlarged, reduced, squashed, stretched, flipped and rotated. Text-

wise, there's a font editor, 9 character sizes, and more. Included are Art Studio and Advanced user guides, and two program disks containing several sample creations.

Firebird (see address list, page 14).

SUPER SNAPSHOT

Version 2.0 of the *Super Snapshot* screen dumping program adds the ability to dump any hi-res or multicolor screen to disk. A switch on the side makes the cartridge invisible in 64 mode, allowing C-128 owners to boot 128 software without removing the cartridge. Price is \$54.95; version 1.0 owners can upgrade by sending their old cartridge plus \$15. Both prices include postage and handling.

Computer Mart, 206-695-1393 (see address list, page 14).

SUPER DISK UTILITIES for the C128 & 1571



Super Disk Utilities is the ultimate utilities disk for the 1571 disk drive and C128 computer. Super Disk Utilities is a full featured disk utility system that will perform virtually every CBM DOS function available. No need for numerous utility disks to perform various functions. SDU does it all!

- Copy whole disks (with 1 or 2 drives)
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data), scratch or unscratch files, lock or unlock files, erase a track or a whole disk, create auto-boot and much more!

SDU helps you learn the inner workings of the 1571 drive with the 1571 Memory Monitor and unique RAM Writer. With these options you can assemble, disassemble any section of drive RAM or ROM. Use the Ram Writer to program the 1571 RAM yourself! SDU uses an options window to display all possible choices available at any given time. No need to memorize hidden commands. SDU fully supports a second 1571 drive. Many of the utility functions also work on the 1541 drive. SDU performs many MFM utility functions including analyze MFM disk format, format MFM disks, read a CP/M + directory, format in CP/M + (GCR format) and more. Super Disk Utilities is available for only \$39.95!

Super Disk Librarian - Full featured disk cataloging & library system for the C128 in 128 mode - \$29.95

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Music of the Masters - A must for all classical music lovers. Set of 5 disks for the C64 only \$34.95!

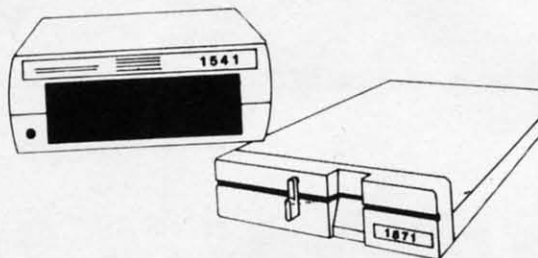
Mr. Quizzer - Test making program for the C64 or C128. Perfect for teachers or students. Only \$19.95

The Great War - WWI strategy game for the C128 in 128 mode. \$29.95

Spirit-Writer - Word processor for the C64. Includes 30,000 word spelling checker. Only \$29.95!

BASICally Simple 64 - How to use C64 Basic 2.0 in Basic programs - \$14.95

BASICally Simple 128 - How to use C128 Basic 7.0 in Basic programs. \$19.95



1541/1571 Drive Alignment

1541/1571 Drive Alignment reports the alignment condition of the disk drive as you perform adjustments. On screen help is available while the program is running. Includes features for speed adjustment and stop adjustment. Complete instruction manual on aligning both 1541 and 1571 drives. Even includes instructions on how to load alignment program when nothing else will load! Works on the C64, SX64, C128 in either 64 or 128 mode, 1541, 1571 in either 1541 or 1571 mode! Autoboots to all modes. Second drive fully supported. Program disk, calibration disk and instruction manual only **\$34.95!**

FUN BIORHYTHMS

This program for the C64 is designed to print your personal biorhythmic chart on your printer. Enter your birthdate, today's date and the number of days for which you want your chart and printer does the rest. What will your physical, emotional and intellectual cycles be for the next month? Only your C64 knows for sure. Only **\$9.95!**

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DEBUGGER

The *Micro Detective* debugging system offers such tools as automatic error detection/analysis and advanced tracing capabilities. A programmer's utility kit includes 30 commands and a built-in cross reference of variables; an editing feature permits the programmer to scroll up and down a listing. For the C-64; \$49.95 (shipping included).

American Made Software, 916-652-5338 (see address list, page 14).

NO FISH STORY

For every rotten apple, there's a plum. Ralph Lees of Poseidon Electronics read our notice in the August *Scuttlebutt* about Schneider Software's failure to fulfill orders for their \$2.00 disk-based CP/M catalog. Concerned about the bad name incidents like this give the mail order industry, Ralph has offered to send his own CP/M catalog at half price (\$1.00 plus a 73¢ SASE) to anyone who placed a \$2.00 bet on Schneider's integrity and lost. Have no doubts about Poseidon's integrity,

though—we know Ralph Lees personally and are happy to vouch for him. Be certain to mention both Schneider and *Ahoy!* when you order the catalog.

Poseidon Electronics, 212-777-9515 (see address list, page 14).

BANK STREET DATABASES

Sunburst and the Bank Street College of Education have announced six new C-64 databases for use with the *Bank Street School Filer*. The databases offer teachers quick access to information on the subjects of Animal Life, Astronomy, Endangered Species, North America, Space, and the United States. Teacher's guides provides numerous lessons, suggestions for classroom discussions, and reproducible activity sheets. Each package (copyable disk, backup, and guide) sells for \$59.

Sunburst will send a videotape, "Using Databases in the Classroom: Bank Street School Filer", on free 30-day loan to teachers who request it.

Sunburst, 914-769-5030 or 800-431-1934; in Canada 800-247-6756; in AK call 914-769-5030 collect (see address list, page 14).

SPEECH DIAGNOSIS

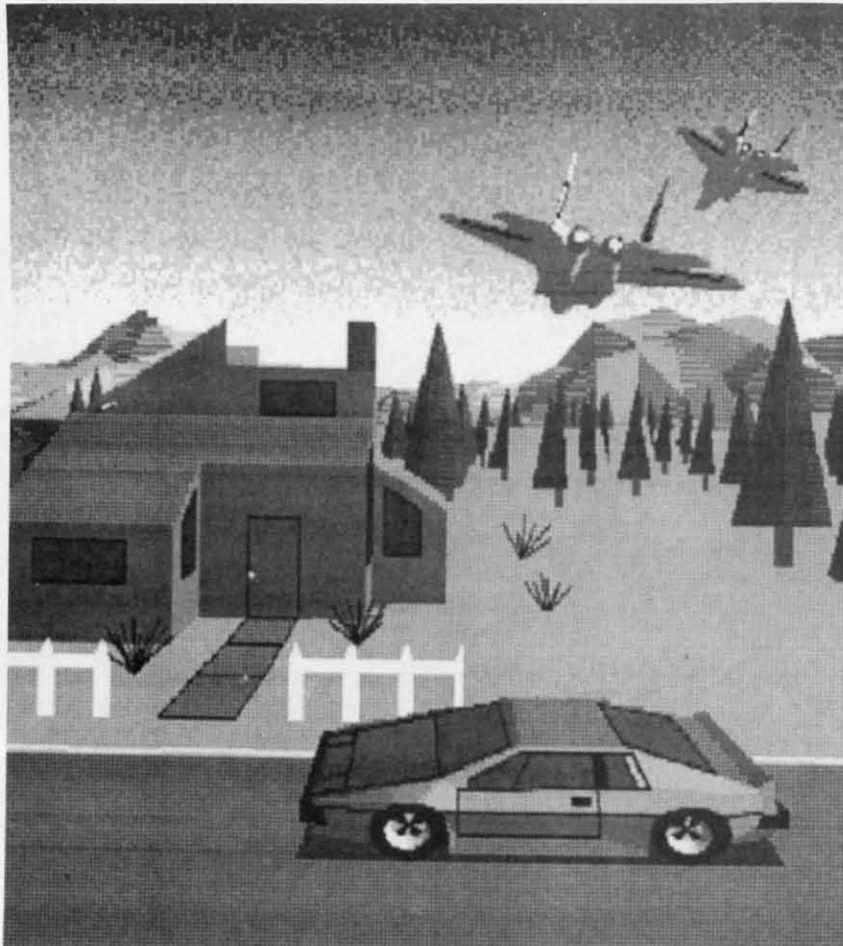
A C-64 disk designed to assist teachers in identifying speech and language problems in preschoolers through third graders includes a speech screening guide, speech/language/hearing test request form with parent authorization section, and a parent guide, "10 Ways to Improve Speech Skills at Home." Price is \$15.00.

Hilltop Speech and Language Service, 213-490-0210 (see address list, page 14).

AMIGA TV GRAPHICS

VideoScape 3D (\$199.95) lets Amiga users produce "TV quality" graphics and animations with as little as 512K RAM (though 2 megabytes or more is recommended). This is accomplished through three programs: *Designer 3D*, for making 3D objects (via entry of X,Y,Z coordinates or point-and-click); *PlayANIM*, for playing animations back in real time; and *VideoScape 3D*, for making the finished video, plus utilities for creating geometric shapes like spheres, cones, rectangles, and fractal landscapes.

Aegis Development, Inc., 213-392-



VideoScape 3D lets the Amiga user create graphics via X,Y,Z coordinates or with one of the supplied utilities. **READER SERVICE NO. 277**

9972 (see address list, page 14).

64/128 & AMIGA GAMES

Two from Firebird, each \$39.95 for the 64, \$44.95 for the Amiga:

Knight Orc, a three-part graphic adventure, posits the player as an oppressed orc who gets a chance to take his revenge on mankind. An advanced language interpreter and a 1000- word vocabulary make high-level commands possible.

Sequel to *The Pawn*, *The Guild of Thieves* also takes place in the mythical kingdom of Kerovnia, though the neighborhood has deteriorated somewhat since the player's previous visit. Included with the adventure game are a 40-page novella, play guide, and other materials.

Firebird (see address list, page 14).

The lovely Daphne is trapped in *Arazok's Tomb* (\$49.95), and you, an ace reporter, must comb the forests of Scotland, looking above and below

ground for clues to her whereabouts. The graphic adventure is Aegis' first game for the Amiga.

Aegis Development, Inc., 213-392-9972 (see address list, page 14).

A mystery for the C-64 with over 2000 different solutions, *Intrigue!* (\$34.95) requires you to find your missing brother Joe, a detective who had been investigating a scheme to release a dangerous virus into the air of the nation's capital. You must interact with characters at various locations in Washington to find Joe, deactivate the device, and finger the villain(s).

Spectrum HoloByte, 415-522-3584 (see address list, page 14).

C-64 and Amiga versions of *Dark Castle*, the Macintosh action/adventure game, will be released this fall by Three-Sixty Inc.

Three Sixty Inc., 408-879-9144 (see address list, page 14).

Nord and Bert Couldn't Make Head or Tail of It comprises eight interac-



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tive short stories that take place in the offbeat Town of Punster. The reader restores order by deciphering messages full of double meaning and word trickery. In *Shake a Tower*, for example, you'll dine with lunching mobsters and munching lobsters as you interpret spoonerisms; in *Buy the Farm* cliches will take on literal meaning. \$34.95 for the C-64, \$39.95 for the Amiga.

Infocom, Inc., 617-492-6000 (see address list, page 14).

Activision and FASA Corporation, publishers of the BattleTech series of science fiction and role playing board games, have agreed to jointly develop adventure software based on FASA's products.

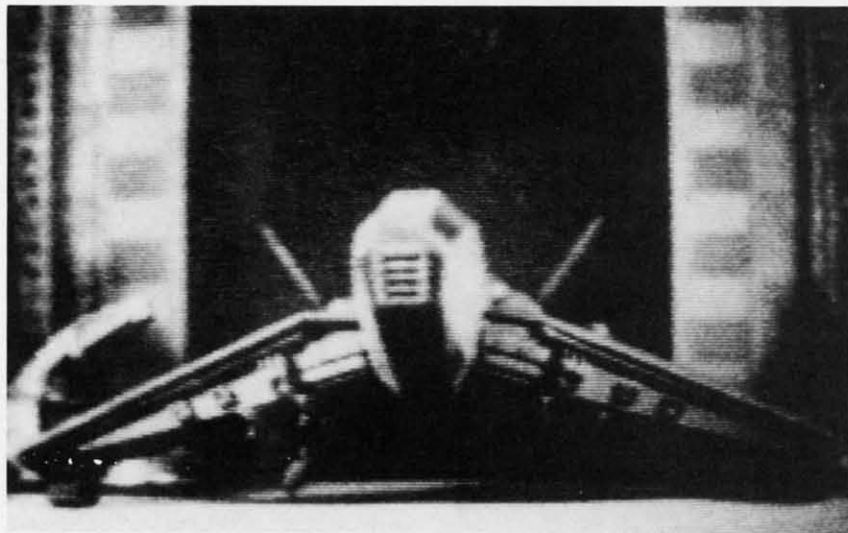
Activision, 415-960-0410 (see address list, page 14).

forward and reverse thrusters, twin 3-D screens, real-time infrared graphics, computer information data link, and onboard subatomic analyzer/decoder. For the 64; \$44.95.

The Lip Stik, a voice-activated control headset designed for use with *Echelon*, is included with the game.

Access Software, 801-298-9077 (see address list, page 14).

California Games (\$39.95) lets one to eight totally mellow C-64 gamers compete in events like Half Pipe Skateboarding, Foot Bag, Surfing, and Roller Skating. Over 3000 prizes valued at over \$80,000, ranging from Kawasaki Jet Skis to Costa Del Mar sunglasses, will be given away through an Instant Winner Game packaged in each game box and through radio promotions. An



The pilot of Echelon's Lockheed C-104 Tomahawk watches the action on twin screens displaying 3-D graphics. **READER SERVICE NO. 278**

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The *Echelon* 3-D space flight simulator centers around a secret military facility where a few highly skilled pilots will be trained to operate the 21st century's most advanced combat and exploration vehicle, the Lockheed C-104 Tomahawk. Through a series of simulators, you'll learn to operate the C-104 to its maximum potential. When you've got the right stuff, you'll be assigned a patrol zone, where through retrieval of artifacts and information you must make sense of a series of mysterious events occurring inside the area. The craft features four weapons systems, bidirectional teleporter unit, unmanned RPV (Remote Piloted Vehicle), antigravity braking and hovering,

Amiga version will follow in the fall.

Epyx, Inc., 415-366-0606 (see address list, page 14).

Spinnaker will distribute the Australian *Bazooka Bill* (\$19.95) in the US under its UXB label. The title character in the C-64 adventure game is a one-man battalion armed with every weapon imaginable, which he uses to fight off an endless stream of enemy soldiers, tanks, trucks, and aircraft.

Spinnaker Software, 617-494-1200 (see address list, page 14).

The following from Accolade:

Apollo 18: Mission to the Moon (\$29.95) makes it possible to recreate any of the original 1960's moon missions on the 64. Screen graphics are



Designed for use with Echelon, the Lip Stik voice-activated headset is used to control various ship activities including the vehicle's weapons systems.

based on actual footage of the missions. The player assumes the roles of mission control specialist and astronaut, with a variety of precision tasks to perform from prelaunch to splashdown.

Test Drive puts a player behind the wheel of some of the world's top sports cars, such as the Lamborghini Countach and the Ferrari Testarosa. The interior of the car and the road are seen from the driver's viewpoint, providing the sensation of an actual test drive. The object is to cover different sections of an ordinary highway within a time limit. \$29.95 for the 64; \$44.95 for the Amiga.

Mini-Putt (\$29.95) offers a light-hearted approach to miniature golf with cartoon-style animation and wacky courses and holes. Each course has a theme such as famous movies or countries around the world, and each hole depicts characteristics of the theme in animated detail. Three varieties of obstacles are encountered: paths, requiring precise aim (bridges); setbacks, objects that interfere with the ball; and timing, requiring a shot at a precise moment (windmills).

Accolade, 408-436-0900 (see address list, page 14).

MODULA CONSTRUCTION

Benchmark (\$199) provides a Mod-

ula-2 program development environment for Amiga users via three modules: an Editor (with over 125 commands for dealing with multiple files, windows, and buffers), a Compiler (implementing the entire Modula-2 language and compiling programs at an average speed of 10,000 lines per minute with burst speeds of up to 30,000 lines per minute), and a Linker (activated by a single key). The program can be used immediately, with no installation. Included as well are Amiga hardware/software support libraries and standard Modula-2 libraries.

Oxxi Inc., 714-999-6710 (see address list, page 14).

REALIGNMENT

Free Spirit has added speed adjustment and end stop adjustment features to its 1541/1571 Drive Alignment program. The price remains \$34.95.

Free Spirit Software, Inc., 312-352-7323 (see address list, page 14).

TOOLKIT RETOOLED

The Metacomco Toolkit (\$49.95) has been upgraded, with Version 1.2 incorporating Unix-based Make and Touch utilities, purportedly twice as comprehensive as commercial utilities sold separately at twice the price of the entire Toolkit package. The program's

Free Form Data Base

COMAL 2.0 automatically indents and capitalizes keywords for you as you type in this complete program. The AUTO command provides line numbers:

```
PRINT "Last character is command:"
PRINT " .      -- add to file,"
PRINT " ?      -- search file,"
PRINT " @      -- exit program."
DIM ln$ OF 80, f$ OF 80, cmd$ OF 1
REPEAT
```

```
  get'line'from'user
  CASE cmd$ OF
    WHEN "."
      add'line'to'file
    WHEN "?"
      display'matches
    OTHERWISE
      NULL //do nothing here
  ENDCASE
UNTIL cmd$="@"
```

```
//
PROC get'line'from'user
REPEAT
  INPUT "> ": ln$
  UNTIL LEN(ln$)>0
  cmd$:=ln$(LEN(ln$):LEN(ln$))
  ln$:=ln$(1:LEN(ln$)-1)
ENDPROC get'line'from'user
//
```

```
PROC add'line'to'file
TRAP
  OPEN FILE 2,"ffdb.dat",APPEND
  HANDLER // create file first
    OPEN FILE 2,"ffdb.dat",WRITE
  ENDTRAP
  WRITE FILE 2: ln$
  CLOSE FILE 2
ENDPROC add'line'to'file
//
```

```
PROC display'matches
TRAP
  OPEN FILE 2,"ffdb.dat",READ
  WHILE NOT EOF(2)
    READ FILE 2: f$
    IF ln$="" OR ln$ IN f$ THEN
      PRINT f$,"."
    ENDIF
  ENDWHILE
  CLOSE FILE 2
HANDLER
  PRINT "Write something first."
ENDTRAP
ENDPROC display'matches
```

Example, using the program:

> COMAL is nicer than BASIC.
«file is created»

> National support group.
«text is added to file»

> nicer?
COMAL is nicer than BASIC.

> support?
National support group.

This program runs unchanged on IBM PC, C64, C128, and CP/M COMAL 2.0 implementations.

COMAL Users Group USA Ltd
6041 Monona Dr, Madison, WI 53716
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other AmigaDOS commands are Pipes, Librarian, Disassembler, Auxiliary CLI, Mount, Browse, Enlarge, Pack, and Unpack.

Metacomco (see address list below).

BOOKS

Becoming an Amiga Artist (\$19.95) provides beginners and advanced users with tricks and tips for creating charts, graphs, paintings, digitized images, animation, and sound and speech, both in AmigaBASIC and via programs like *AegisDraw*. Also described are ways to reproduce screens on printers, plotters, VCRs, and with 35mm cameras. A number of type-in programs are included.

Scott, Foresman and Company, 312-729-3000 (see address list below).

The Big Tip Book for the Commodore 64/64C/128 (\$16.95) details hundreds of shortcuts developed by users, concerning everything from hooking up



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equipment to advanced programming.
Bantam Books, 212-765-6500 (see

address list below).

Commodore 128 Data File Programming focuses on the structure development, and use of program, sequential, and relative files in BASIC 7.0. Sample applications cover uses in the home, in education, in business, and in investment, among others.

TAB Books Inc., 717-794-2191 (see address list below).

PROGRAM SEARCH

Softwhere? is the name of a new service that will help users of all popular microcomputers, including Commodore, to find the programs suited to their particular needs by means of an information base of thousands of programs. A free copy of their booklet, "Guide for Selecting Computer Software," is available on request.

Softwhere?, 916-674-3688 (see address list below).

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Bristol BS2 8RZ
United Kingdom

Oxxi Inc.
1835-A Dawns Way
Fullerton, CA 92631
Phone: 714-999-6710

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103 Waverly Place
New York, NY 10011
Phone: 212-777-9515

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Phone: 617-494-1200

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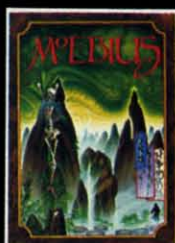
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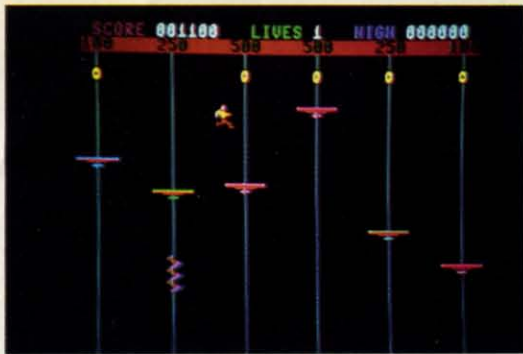


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PLATFORMS

For the C-64

By Tony Brantner

Platforms is a one-player arcade game for the Commodore 64 which brings new meaning to the phrase "go for the gold."

Use *Flankspeed* (page 95) to type in and save a copy of *Platforms*. Before running the game, be sure to have a joystick plugged into Port 2.

When the game begins, you are standing on the first of six platforms. Each moves up and down on a shaft, changing direction at random. At the top of each shaft is a gold ring. Touching a ring earns you the corresponding number of points shown above it. You can run on a platform by moving the joystick to the left or right (you cannot run off the edge). To jump from one platform to another, or to jump up and grab a ring, press the fire button and move the joystick in the direction that you want to go (left, right, or centered). If you fail to land on a platform, you will lose

one of your lives.

There are also killer corkscrews to contend with. These slinky little devils twist their way up and down the shafts. When they hit a platform from underneath, it becomes electrified. If you try to jump on an electrified platform, or happen to be standing on one, you will be knocked off, losing a life in the process. Fortunately, the electrical charge lasts only a few moments.

Collect all six rings, and you will move on to the next level which is a little faster. Although you begin the game with only three lives, bonus lives are awarded for every 10,000 points scored. You can hold a maximum of nine in reserve. The game can be frozen by pressing the SHIFT LOCK key. Once you run out of lives, press any key. The high score will be adjusted if necessary, and you can play again. □ **SEE PROGRAM LISTING ON PAGE 99**

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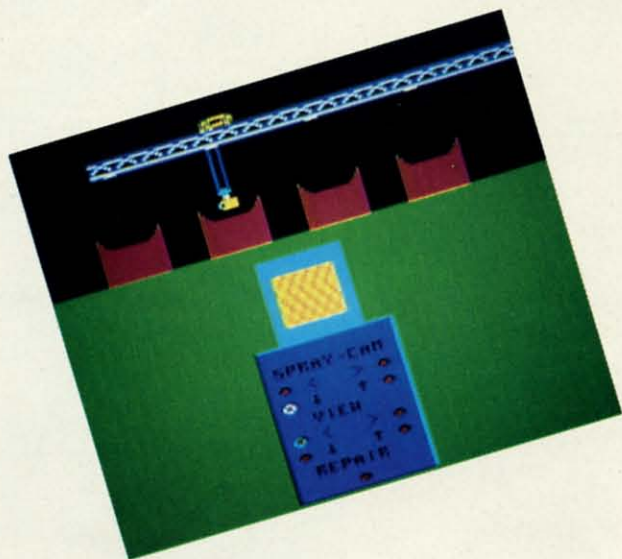
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







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By Bob Blackmer



With apologies to Benn Dunnington, *Spray-Cam* is written in machine language and must be entered using *Flankspeed* (see page 95). After typing in and saving *Spray-Cam*, reset the computer and LOAD "SPRAY-CAM",8,1. Then SYS 49152 to start. ☐ **SEE PROGRAM LISTING ON PAGE 96**

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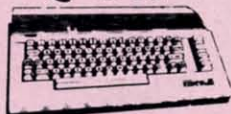
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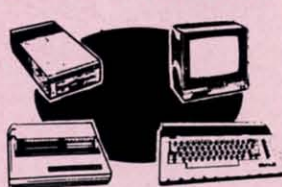


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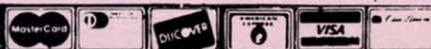
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To store and manipulate data efficiently within your programs, you must choose the proper data structures. Simple numeric and string variables are fine for dealing with single, independent quantities. More complicated and interrelated quantities demand more sophisticated types of variables.

BASIC does not provide a very rich variety of data structures. Besides simple variables, the only other type of data structure explicitly supported in BASIC is the array. Fortunately arrays can be used to duplicate the function of any other data type.

This month we will review arrays in BASIC and investigate a very useful form of data storage, the linked list. We will see that the proper choice of data structure significantly affects your efficiency in writing programs as well as the speed of the programs themselves.

ARRAYS IN REVIEW

We have previously discussed BASIC one- and two-dimensional arrays (see *Rupert Reports* in the May '84 and November '84 *Ahoy!*). Admittedly that was a long time ago, so a review is in order.

An array is a data structure that can be used to store information of a sequential nature. Suppose you are writing a program that will deal with the colors of the spectrum. You might want to print the names of the colors alphabetically or in random order or in spectral order. In any case, there will be some sequence associated with this color data.

It would be impossible to store the color names in simple variables. For example, we could have

```
A$="RED" : B$="BLUE" : C$="GREEN"
```

and so forth. This simple data structure is very limiting. For example, how could your program sort and print these colors alphabetically? It would be cumbersome at best. Something like this might work:

```
10 IF A$<B$ AND A$<C$ THEN PRINT A$ : GO TO 40
20 IF B$<A$ AND B$<C$ THEN PRINT B$ : GO TO 60
30 PRINT C$ : GOTO 80
40 IF B$<C$ THEN PRINT B$ : PRINT C$ : END
50 PRINT C$ : PRINT B$ : END
60 IF A$<C$ THEN PRINT A$ : PRINT C$ : END
70 PRINT C$ : PRINT A$ : END
80 IF A$<B$ THEN PRINT A$ : PRINT B$ : END
90 PRINT B$ : PRINT A$ : END
```

This program is, in a word, absurd. If the program you are writing requires contortions like these, then you should definitely be using a different data structure.

The simple variables in the example above are not useful for representing sequential data, that is, data in which the various values are related to one another. Arrays simplify the tasks of sorting, shuffling, and storing related data.

Here is how the same program could be written using an array.

```
1 D$(0)="" : D$(1)="RED" : D$(2)="BLUE" : D$(3)="GREEN"
5 REM - PERFORM INSERTION SORT -
10 FOR N=2 TO 3 : T$=D$(N) : K=N
20 IF D$(K-1)>T$ THEN D$(K)=D$(K-1) : K=K-1 : GOTO 20
30 D$(K)=T$ : NEXT N
40 FOR N=1 TO 3 : PRINT D$(N) : NEXT N
```

The color values are stored in the array D\$(). D\$ refers

A Rainbow of Data Structures

ARRAYS, LISTS, AND LINKED LISTS

BY DALE RUPERT

not to an individual data item but to a collection of data. Each specific item in the collection is identified by the *subscript* within parentheses. Each data item is an *element* of the array.

Graphically, the data in the array looks like this:

Subscript	1	2	3
Data	RED	BLUE	GREEN

The subscripts provide an index or a pointer by which the program can choose any data item.

Lines 10 through 30 in the program above sort the data values alphabetically with an algorithm called an insertion sort. The data values are moved around within the array. Once the sorting is finished, the D\$ array looks like this:

Subscript	1	2	3
Data	BLUE	GREEN	RED

Clearly the second program is far better than the original version which did not use arrays. Arrays provide a lot of flexibility in organizing and selecting data.

Suppose you want to add another color to the list. Modifying the first program to sort and print four items would be a monumental task. The resulting program would be even uglier than before.

On the other hand, it is nearly trivial to modify the second program for more data items. Simply define the new data and change the 3s in lines 10 and 40 to the desired number of items. You must add a DIM statement if the array will have subscripts greater than 10.

NODES AND LISTS

We have seen that arrays are superior to simple variables for storing and arranging related data. One disadvantage of arrays is that they are strictly sequential in nature. If we want to reorganize the data in an array, we must actually

move the data values around within the array. We will see that this can be very time-consuming in some applications.

The next data structure we will consider is the list. The data in a list is stored in a structure called a *node*. We said that each data item in an array is an *element* of the array. An *element* of an array is comparable to a *node* of a list. The main difference between an element of an array and a node of a list is that a node may be subdivided into fields. Each field stores a data item.

Suppose we want to keep track of colors in the rainbow and their corresponding wavelengths measured in nanometers. A list structure for such data might use a node with two fields like this:

Field #1	#2
Color Name	Wavelength

A list of color data can be represented as follows:

Node # 1	2	3
RED 700	BLUE 470	GREEN 500

We can create this list data structure in BASIC using two arrays. For example,

```
DIM ColorName$(20),Wavelength(20)
```

dimensions the two arrays which will contain no more than 20 elements each (ignoring the zeroth element). In Commodore BASIC, we would need to shorten the array names and remove the hidden key words. We will use CN\$() and WL() for the color name and the wavelength, respectively. In this example, one field is a string array and the other is a numeric array.

Node number 1 is created in BASIC with the following statements:

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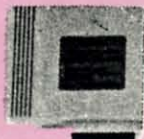
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CN\$(1) = "RED" : WL(1) = 700

50 NXT = 4

The other nodes are created similarly. Notice that the subscript of the array corresponds to the node number.

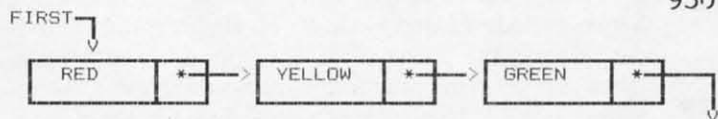
Clearly there is nothing "magical" or mysterious about the list structure. Undoubtedly you have used multiple arrays in your programs in a similar manner.

Our goal here is to formalize these structures and to use the nomenclature generally associated with them. When you look at a book of algorithms which describes everything in terms of nodes and lists, you will know what they are talking about.

NOW FOR THE LINKS

The next data structure we will discuss is the singly linked list, or simply, the linked list. The linked list is a useful structure for groups of related data which must be accessed sequentially. Linked lists provide the advantage over simple lists of being easily modifiable. We will see that it is easy to insert and delete data items in a linked list, something that can be very time-consuming with the simpler data structures.

The key to linked lists is an item called a "link." A link is a piece of data which indicates how one data item or node in a list is related to another item. Graphically a linked list looks like this:



This linked list consists of three nodes. Each node contains two data items, a color name and a link. The link is shown as an asterisk with an arrow coming from it. FIRST is a separate variable which indicates the start of the linked list. Each link points to the next node in the list. The link of the third node is a special quantity which indicates the end of the list.

In Pascal there is a special data type called a pointer. The pointer is a standard way of implementing links. Since BASIC doesn't have explicit pointers, we must synthesize them.

To represent the data shown above, we will use two arrays, NFO\$() and LNK(). NFO\$() (as in "info") is a string array which will store the information, in this case the color names. LNK() is a numeric array which stores the links.

What are the links? Each link is nothing more than the value of the subscript of the next node in the list. Here are the BASIC statements for this linked list:

```
10 FIRST = 1
20 NFO$(1) = "RED" : LNK(1) = 2
30 NFO$(2) = "YELLOW" : LNK(2) = 3
40 NFO$(3) = "GREEN" : LNK(3) = -1
```

In order to add items to this list, we will also use a variable called NXT. This quantity indicates the next available node number in the list. It is initialized with

Recall that the node number merely refers to the subscript of the array element.

With the preliminaries understood, let's see what we can do with this linked list. It is easy to add a node to the end of the list. For example, to put "BLUE" in its proper place after "GREEN" which is node 3, we would use the following statements:

```
100 LNK(3) = NXT
110 NFO$(NXT) = "BLUE"
120 LNK(NXT) = -1
130 NXT = NXT + 1
```

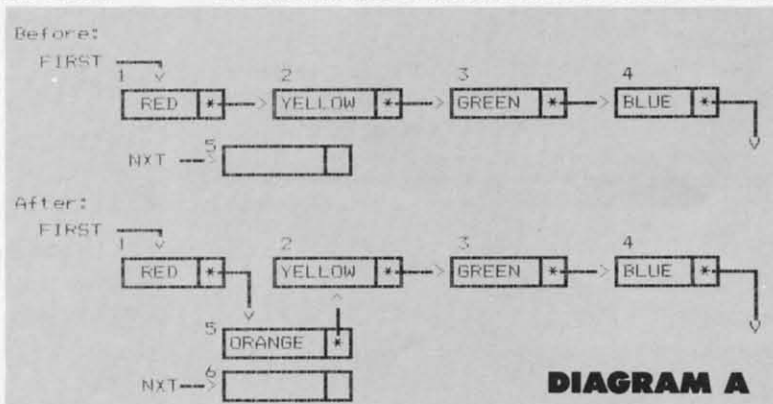
Line 100 sets the link of node 3 ("GREEN") to the next available node which is 4 in line 50. Line 110 stores the data in the new node, and line 120 sets the link of the new node to -1 to indicate that this is the last node in the list. Line 130 updates the "next node" pointer.

The following routine steps through the nodes sequentially and prints the data from each information field:

```
900 N = FIRST
910 PRINT NFO$(N)
920 N = LNK(N)
930 IF N <> -1 THEN GOTO 910
```

The index N is set to point to the first node in line 900. Line 910 prints the information portion of that node.

Line 920 in the above routine shows a nifty characteristic of linked lists. In order to locate the next



node in the list, just read the link value that is stored in the current node. If that link value is not -1, the program loops back for additional printing. If the link value is -1, the program has reached the end of the list, and the program ends.

COLORFUL MANIPULATIONS

Linked lists really shine when data must be inserted or deleted in the midst of the list. For example, to insert "ORANGE" after "RED", the procedure looks graphically as in Diagram A above. The numbers above are the Node Numbers which are actually the subscripts of the arrays. You will notice that the array subscripts no longer repre-

sent the sequential order of the list.

The program to insert a node after Node #1 as shown in Diagram A above is as follows:

```
200 OLDLNK = LNK(1)
210 LNK(1) = NXT
220 LNK(NXT) = OLDLNK
230 NFO$(NXT) = "ORANGE"
240 NXT = NXT + 1
```

Line 200 saves the original value of the first node's link. Line 210 updates Node 1's link to point to the new node. Line 220 stores the original link from Node 1 as the link of the newly inserted node. The information value of the new node is written in line 230. The value of the NXT pointer is incremented to show the next available node number in line 240. That's all there is to it.

The current values of the variables are

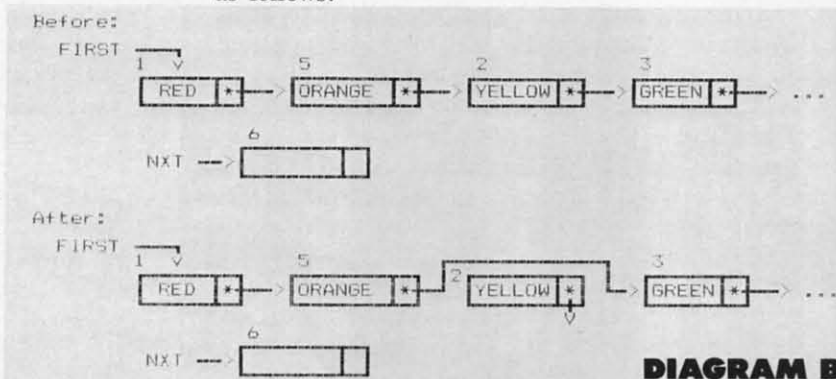
Node #	NFO\$	LNK
1	RED	5
2	YELLOW	3
3	GREEN	4
4	BLUE	-1
5	ORANGE	2

The node # corresponds to the subscript of the array. To follow the path through this list, notice that the link from Node #1 points to Node #5. The link from Node #5 is to Node #2. Node #2's link leads to #3 which points to #4. Node #4 has a link value of -1, hence it is the last item in the list.

If the program jumps to the print routine at line 900 discussed earlier, the list will be printed in the order just described: Red, Orange, Yellow, Green, Blue. The node # no longer indicates the sequence of the list. The sequence

is established by following the links.

Removing a node of a linked list is a very easy task. Graphically the process to remove Node #2 ("Yellow") is as follows:



Here is the program to remove Node #2 ("Yellow") as depicted above. We simply reroute the link from the preceding Node #5 to point to the succeeding Node #3:

```
300 LNK(5) = LNK(2)
310 LNK(2) = -1
```

Line 300 sets the link of Node #5 to point to the node originally linked to Node #2. Line 310 breaks the connection between Node #2 and Node #3 by assigning the "end of list" value to the link of Node #2. Once again, if the program jumped to the print routine at line 900 above, the revised list would be printed properly: Red, Orange, Green, Blue.

Node #2 is left unused and unavailable. If memory is very limited and if many such deletions would occur, a more complicated scheme could be implemented to reuse any nodes deleted from the list. To do this would require using another linked list for available memory. NXT would be updated, and links in the "available memory" list would be revised whenever a node was removed from the original list.

END OF THE RAINBOW

If you are not totally convinced that linked lists are relatively easy and worthwhile to use, keep reading. For a grand finale, we will run some benchmark tests with simple arrays and with linked lists, comparing their abilities to insert and delete data.

The tests overwhelmingly show the reason for using linked lists. When large numbers of items within ordered data lists must be added or deleted, linked lists really shine.

To see one disadvantage of simple array lists, look at the steps needed to add a single data item between two others. For example, insert "Orange" between "Red" and "Yellow" in this list.

Before:
Subscript # 1 2 3 4 5
Data RED YELLOW GREEN BLUE (empty)

During:
Subscript # 1 2 3 4 5
Data RED (open) YELLOW GREEN BLUE



After:

Subscript # 1 2 3 4 5
Data RED ORANGE YELLOW GREEN BLUE

First, all values from "Yellow" to the end of the list must be moved to the next higher subscript value to make room for the new data. Those results are shown in the "During" phase above. Then the new data item can be written into the available space.

If there are one thousand items in the list, and a new item must be inserted between numbers 1 and 2, a large amount of data must be shuffled. This can take quite a long time.

Deleting an item from a simple list is similarly time-consuming. The procedure is nearly the same as for inserting an item except that all items to the right of the deletion must be moved left.

Run the program *Linked List Showoff* (page 98) to see how significant the time differences are. The program creates a simple array of 500 consecutive odd integers from 1 to 999, and it creates a linked list of the same values. The program then inserts 500 even integers from 2 to 1000, one after each odd value in the two original lists. Next the 500 odd integers are deleted from the two lists, and the resulting lists of even integers are printed. The times to create, modify, and print the two lists are displayed.

This program emphasizes the advantages of linked lists. In fairness, we should point out that the simple array does

have some advantages. It uses less memory than the linked list. Also, the simple array needs less time to be printed since its subscript is simply incremented to step through the list. Using links to step through the linked list for printing is somewhat more time-consuming.

Searching for an item in an array list may be quicker under some circumstances than searching through a linked list. In this sample program, these advantages of a simple array list are obviously outweighed by the insertion/deletion capabilities of the linked list.

Change NUM in line 50 to increase the number of odd integers in each list. You will find that doubling NUM doubles the time for the linked list, but it quadruples the time for the simple array. As the number of items increases, the advantage of linked lists becomes even greater.

This month we have covered singly linked lists. The links always point toward the succeeding item in the list. In a future article we will see that when we are lost in a maze, it can be useful to have links leading us back to our previous locations. Doubly linked lists as well as other sophisticated data structures will be the topic of further discussions in this column.

In the meantime, if you are having troubles keeping the data in your programs under control, see if linked lists are appropriate. A linked list just might be the pot of gold at the end of the rainbow. □

SEE PROGRAM LISTING ON PAGE 98



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Full Disclosure

By Richard Herring

Several of you have written to ask me about the COMAL Users Group USA. That seems natural enough since my *COMAL Column* and their ads both appear in these pages. Well, it's probably time to disassociate myself.

I only write for *Ahoy!* and have no connection to the COMAL Users Group. Just like some of you, I buy books and programming aids from them. Every item in my COMAL library was paid for, and is my very own.

Now, let's proceed to answer your questions about the COMAL Users Group. The Group is, so far as I know, a small business that promotes the use of COMAL as a good language for both programming and learning. It markets a two-page list of COMAL materials, including books, disks, and a magazine.

The Group is, in fact, your one-stop shopping source for things COMAL. So let me tell you a little about the various programming aids that are available.

First, the COMAL language itself is available on disk or cartridge for Commodore computers. Version 0.14 is supplied on disk. Disadvantages of this version are that it leaves only 10K of RAM for you to write programs in, and that it lacks some of the powerful specialized commands of version 2.0. The big advantage of version 0.14 is that it can be found in many user group libraries where you can copy it, then check it out.

On the 0.14 disk are a tutorial and sample programs sufficient to get you started if you have some programming background. If you buy the \$30 COMAL 0.14 Starter Kit, you'll also get two 60-70 page booklets (normally \$7 each), *COMAL From A to Z* and the *COMAL Workbook*, six issues of the newsletter/magazine, and several program disks.

The *COMAL From A to Z* booklet is essentially an alphabetical listing of the key words in version 0.14, including graphics and sprites. The *COMAL Workbook* is a study guide, with exercises and self-tests, written for beginning programmers. It's aimed at about the high school level—it moves way too fast for little kids but will be fine for adults.

COMAL version 2.0 is available on a cartridge for \$100 to \$135 (depending on whether you want the Superchip that provides extra support for the 128). Or, for \$139, you can get the cartridge with the extra chip, two manuals, and several sample program disks. Advantages of the cartridge version are quick loading, many extra commands, and 30K of programming space. Disadvantages are the cost and the inability for your friends to run your 2.0 programs (using the extra, powerful commands) under version 0.14.

Programs written under 0.14 will run under version 2.0 without too much effort on your part to convert them. But then that subject deserves its own column.

The Group also sells a newsletter/magazine called *COMAL Today*, published every 2-3 months. Each issue contains 80 pages (newsprint) of articles, tips, procedures, and sample programs—all dedicated to COMAL. You will find that only six to twelve of these pages contain ads. Once

you have started serious programming in COMAL, the newsletter can be valuable. Much of it is user-written, so it might even be a place for you to break into print. Subscription rates run about \$3 per issue.

Now let's move into books and booklets. *The COMAL Handbook* is a 470-page dictionary of commands for both versions 0.14 and 2.0. It also cross-references commands and shows short sample programs. This \$19 book is one of the few COMAL books you might find at a local bookstore, since it is published by Reston.

Beginning COMAL, widely used in Denmark, was written by Borge Christensen, who was one of the two designers of COMAL over 13 years ago. The \$21, 340-page book is about one half lessons and exercises and one half self-tests and program listings. You should be familiar with computers, but need not have prior programming experience, to make good use of this. The book takes small steps and offers the dedicated learner lots of chance for success.

Foundations in Computer Studies with COMAL, published in Ireland, is a 360-page introduction to structured programming in COMAL. It contains 121 sample programs and is written to cover the standardized version of COMAL which is available to run on several different computers. As a "foundations" textbook, it also covers the history and uses of computers as well as good programming practices in general. It's suitable for high school and college level learners and costs about \$20.

Introduction to Computer Programming with COMAL 80 and the Commodore 64/128 is a 265-page learner's guide to the cartridge version. This book is published in the US by the COMAL Users Group for \$20 and has a matching \$7 answer book. Like the other learning guides, it is suitable for senior high and college students. It jumps in fast, so some familiarity with programming will help.

The *Cartridge Tutorial Binder* (titled *COMAL 80* on the front) is the 320-page tutorial for version 2.0 initially prepared in Denmark for Commodore. It takes you from setting up the computer to using assembly language routines in COMAL programs. This \$25 notebook comes with the Deluxe Cartridge Pak.

Several 60- to 100-page booklets are also available on specific COMAL topics. The \$7 *Cartridge Graphics and Sound* explains the expanded capabilities of the 2.0 cartridge. For 0.14 programmers, *Graphics Primer* (\$15 with disk) is a beginner's tutorial to graphics and sprites.

Captain COMAL Gets Organized is a \$15 introduction (with disk), focusing on modular programming. Two volumes titled *Packages Library* (each \$20 with disk) show how to use packages of new commands in your programs. You should be familiar with COMAL programming for these. Last, *COMAL 2.0 Packages* focuses on how to write your own packages (\$20 with disk). Consider this when you're ready for machine language programming.

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the books. Plus you can buy disks on secondary school subjects, telecommunications, games, and on and on. Also check user group, public domain, and shareware libraries for disks. A medium-size local user group may well have a half dozen or more disks of COMAL programs.

The COMAL Users Group also sells versions of the language for CP/M computers, IBM-compatibles, and Apples (soon, they hope). Next on the list are keyboard overlays, and last, for the truly dedicated, COMAL tee shirts. Books purchased from the Group will have an additional shipping charge added.

Well, that's lots of ways to part us users from our money. So now I'll tell you how to save a buck. If you subscribe to the newsletter (minimum six issues for \$19) you can get special member prices. Discounts range up to 66 percent, with most in the 5 to 30 percent range.

But wait, there's more. (No, I never sold steak knives!) The Group routinely runs specials for members with discounts of 50 percent or more off regular member prices.

The moral of our story? If you really get into COMAL programming (and COMAL is a language worth getting into), become a member and wait for the sale. Remember, I have nothing to lose, so I want you to get the most for your money.

Or, you may want to check your local bookstore for *Structured Programming With COMAL* by Roy Atherton (Wiley), *Starting with COMAL* by Ingvar Gratte (Prentice Hall), and *Adding Structure To BASIC With COMAL-80* by Max Bramer (Addison Wesley).

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You can contact the COMAL Users Group USA at 608-222-4432 or at 6041 Monona Drive, Madison, WI 53716.

You can contact me at P.O. Box 1544, Tallahassee, Florida 32302. Let me know what you think and where you want to go. I'll be happy both to give my advice and to hear yours. Next month, we'll talk generally about how to learn to program and why COMAL is such a good language for just that. After that, with the help of several readers, we'll see just how fast COMAL is and how your programs can benefit. □

Tech Notes

1) Disk version 0.14 leaves only 10K of program memory, while cartridge version 2.0 leaves over 30K. How is this magic accomplished? Version 2.0 always uses the COMAL Kernal, but selects only those extension packages (sets of commands) that the programmer chooses. By not loading the graphics commands if you do not need graphics, version 2.0 saves memory. The cartridge has 64K of ROM that is bank-switched in 4 blocks, of 16K each, over the C-64's BASIC ROM and RAM.

2) Cartridge version 2.0 expands upon disk version 0.14's 140+ commands. It increases the number of sprite commands from 10 to 23 and graphics commands from 26 to 48. It adds many other special commands to support things like paddles, joysticks, and character fonts.

3) The 16K Superchip enhancement to the 2.0 cartridge supports the 128. While it does not give you a true 128 COMAL, it does allow the use of many 128 features. [Editor's Note: By the time you read this, a new C-128 COMAL 2.0 cartridge should be available for \$200 with a manual and demo disk.] It will automatically enable the numeric keypad, autoboot a disk program if you name it "hi", display text and graphics on the 80-column screen (along with other 80-column capabilities), and speed up your disk drive accesses. It also provides BLOAD, BSAVE, RS-232 commands, string and math extensions, and about 100 new commands. The Superchip is user-installable if you are not afraid to open your cartridge and plug in a chip. Or you can get a disk-based version of the Superchip and link it into your programs.

4) Although it is relatively easy to move from BASIC to COMAL, you will have four things to remember. First, COMAL has many more commands; as you learn them, programming gets easier and easier. Second, COMAL is designed for structured programming, which BASIC allows but does not promote. Third, *The COMAL Handbook* lists 32 BASIC keywords that are implemented differently in COMAL. Fourth, your BASIC programs will not run under COMAL, but if they are well-designed, they will often be easy to convert.

[Editor's Note: The Group has just released several new books, and rereleased a few old titles, in looseleaf format at reduced prices. These include *COMAL Cross-Reference* (comparing different implementations of COMAL), *COMAL Collage* (a graphics and sprites tutorial), *3 Programs in Detail* (a guide to *Blackbook*, *Home Accountant*, and *BBS*), *Today Tutorials*, and *Today Tips and Notes* (both compiled from the newsletter).]



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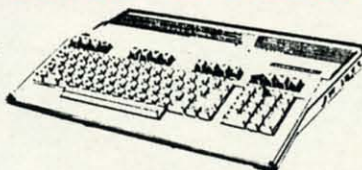
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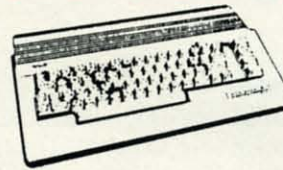
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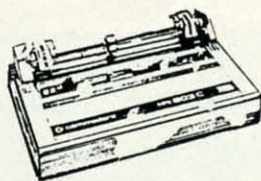
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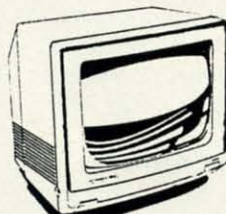
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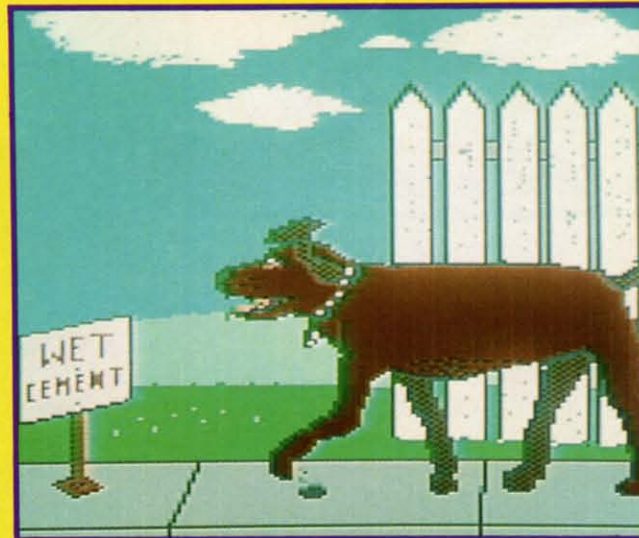
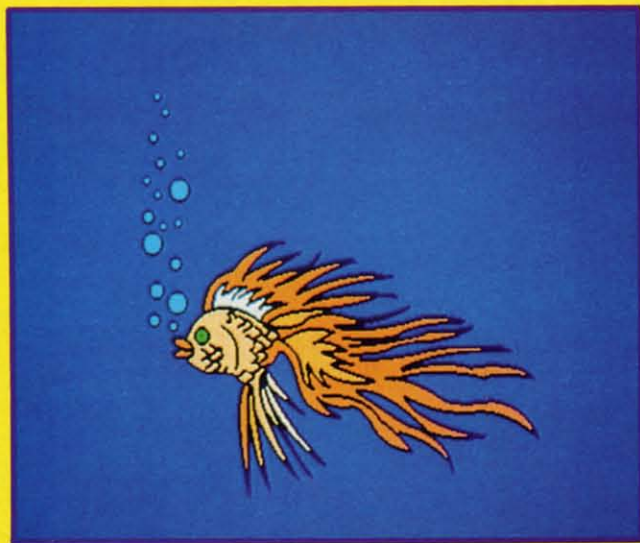
Art Gallery Disk Sale

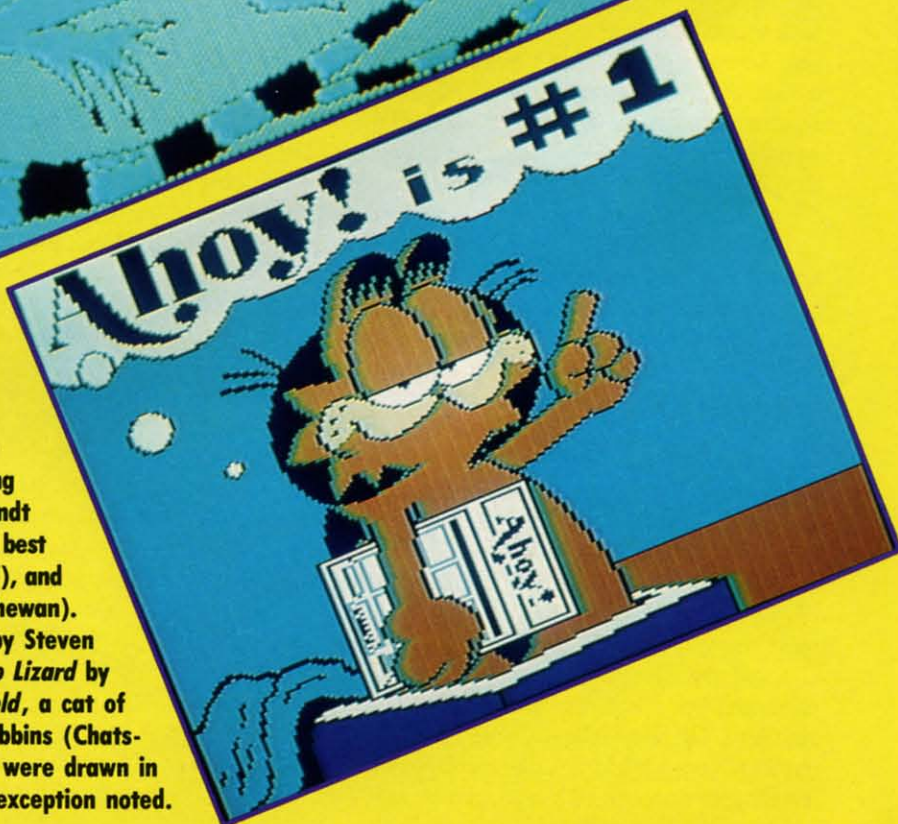
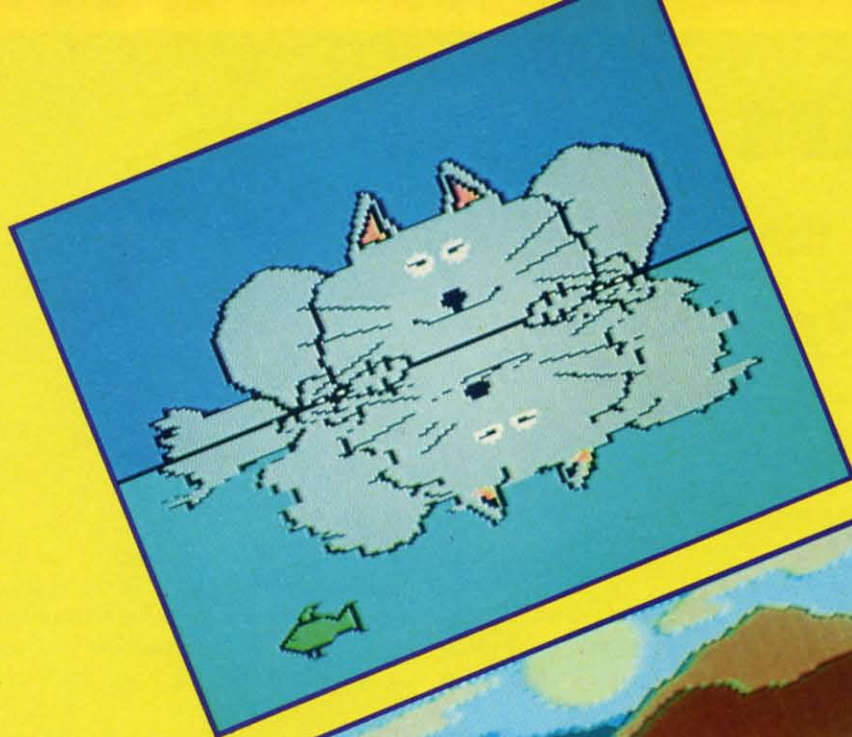
The images on these pages are now available on a monthly disk. Multicolor images are supplied in *Koala* format, while high-resolution images are in *DOODLE!* format. Included are a slide show for easy viewing, along with a bit map dump for your 1525 printer or properly interfaced equivalent. A sample *Art Gallery* disk with slide show and printer dumps is \$10; or send a stamped and self-addressed envelope (business size) for a listing of available *Art Gallery* collection disks. Prices shown are for US and Canada. All others add \$3 per disk. New York State residents please add appropriate sales taxes. Disks may be ordered from Morton Kevelson, P.O. Box 260, Homecrest Station, Brooklyn, NY 11229.

Contribute to Ahoy!'s Art Gallery

The *Ahoy!* Art Gallery offers the opportunity for fame and fortune to any and all aspiring Commodore artists. Simply send Morton (see address above) your work on disk indicating the drawing package or file format of the images. Inclusion of a self-addressed post card will guarantee an immediate response. All graphics produced on the C-64/C-128, Plus/4, and Amiga computers are eligible. In exchange your work will receive the opportunity for display in these pages. All published works will receive royalties based on the monthly *Art Gallery* disk sales. In addition, both published and unpublished images may be included on the various *Art Gallery* collection disks.

Note that the *Art Gallery* is not a contest. Published pictures are selected in an arbitrary and capricious fashion by the *Ahoy!* Art Director based solely on the artistic merit of the individual images.



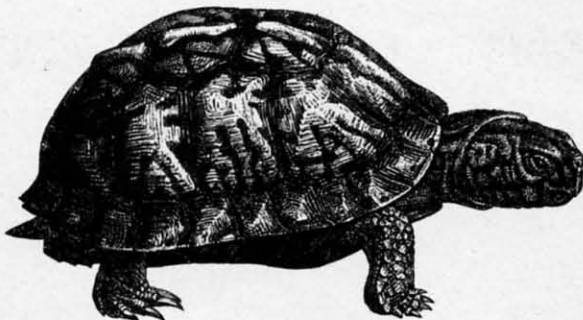


Can't decide whether to go lowbrow or highbrow today? We offer the perfect solution—combining a trip to the *Art Gallery* with a trip to the zoo. *Fishy* at extreme lower left was drawn to scale by Bruce Yarbor (Oklahoma City, OK) on *De-luxe Paint*. The stack of three on the facing page consists of *Mouse* by Marcy Willbrandt (Battle Creek, MI), *Caveman* (and caveman's best friend?) by Michael Montauk (Brooklyn, NY), and *Butch* by Daryl Maksymec (Regina, Saskatchewan). Top to bottom on this page are *Pusstata* by Steven Sellors (Saint John, New Brunswick), *Gecko Lizard* by Robert Tiess (Middletown, NY), and *Garfield*, a cat of obviously discriminating tastes, by Rod Robbins (Chatsworth, CA). All creatures great and small were drawn in everpopular *Koala* format with the single exception noted.

JAM ATTACK

For the C-64 and C-128

By Buck Childress



I've been jammed! And I took it like a r-e-a-l man. I cried, pulled some hair out, and tried clinging to the ceiling. It really didn't help much, though. The crying got my shirt wet, which gave me a chill. Pulling my hair out resulted in a splitting headache. And I quickly realized that if I continued acting as my own hair stylist, I'd soon resemble a billiard ball. The laws of gravity took immediate exception to my attempted walk on the ceiling. Since I couldn't flap my arms fast enough, I fell like a rock. As I lay on the floor, much like a turtle on its back, waiting for someone to come by and roll me over, a thought wandered into my aching head...there must be a way to avoid the jams. If there is, maybe I'll never have to give another demonstration of my terrific self control.

What is a jam? Well, it kind of resembles trying to stuff an elephant into a bird cage. In my case, I was unknowingly trying to save a 65 block program on a disk with 11 blocks free. Since it was 2:00 a.m. and my eyelids were beginning to feel as though the U.S. Navy were using them for anchors, I decided to pack it in for the night. I began tidying up the office while the ill-fated save was in progress. About the time I had everything in order the disk drive shut off. Great, now I could hit the sack. I turned around, put my finger on the computer's on/off switch, and began applying pressure just as my eye caught the blinking light on the drive. Too late...my reflexes aren't what they used to be. Off went the computer, off went my program, and off went my self control. When I regained my composure, I checked the directory. It proudly displayed the program name and that it was zero blocks long. The blocks free were also zero. Oh happy days! Could I possibly recover my lost jewel? No way! It had just passed Neptune, headed for Pluto, traveling at warp 10. I'll never see it again. This meant war! This meant *Jam Attack!*

Jam Attack defends you from the jams. It keeps you informed of the block length of your program before you save it. It also displays the blocks free on the disk currently in the drive. In addition, you can check the drive status if you need to. It works with both BASIC and machine language programs. There is a version for the C-64 and the C-128. Here's how to use it.

After you've saved a copy of *Jam Attack*, run it. The loader POKes the machine language data into memory and checks for errors. When the data is through loading, you can activate it. For the C-64 type SYS 52000 and press RETURN. For the C-128 type SYS 4864 and press RETURN. You deactivate it the same way. This is called toggling.

Let's say you're working on a BASIC program and want to check its block length and the blocks free on the disk. Just press the EQUALS (=) key, then RETURN. *Jam Attack* gives you the rundown, so you can plan your attack against the jams accordingly. This is a quick and easy way to check the blocks free whenever you've made a save or swapped disks. And it's just as easy to get the block count if you've added lines to or deleted lines from your program.

You don't have to check anything before you make a save, though. So don't panic if you forget. *Jam Attack* automatically displays the block length and blocks free before any save is made. It asks if you want to proceed. If you do, the save is made. If not, *Jam Attack* cancels it. If you're using the C-128, *Jam Attack* works equally well with SAVE, DSAVE, and BSAVE.

Jam Attack can check the drive status should you encounter a blinking light. Press the AT (@) key, then RETURN. The status is given and the light takes a hike.

If you happen to be saving a program from within a monitor, the save feature works just like it does in BASIC. You'll get the block count, blocks free report, and the option of proceeding or putting on the skids. Because of the way monitors input your instructions, the EQUALS and AT keys only work from BASIC.

Jam Attack verifies that the disk drive is on before it performs any of its functions. If it's not you'll see:

?DEVICE NOT PRESENT ERROR

This prevents the computer from doing a nose dive when it tries to access a routine that requires the drive to be on.

Give *Jam Attack* a whirl. Keep those jams where they belong...in a sandwich, not on your disk. □

SEE PROGRAM LISTINGS ON PAGE 102

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C-64 RAMDrive

By Anthony Bertram

Commodore's 1764 RAM Expansion is now available, and many 64 owners are probably not sure what it can do for them. The extra RAM will not be accessible for running programs but will function as a RAM disk, a large chunk of random access memory used for temporary storage. The advantage of a RAM disk is speed: programs and data can be loaded and saved almost instantly. The disadvantage is that RAM disks can only store data while the power is on.

64 RAMDrive simulates a RAM disk and gives C-64 owners the chance to try some of the major features on the unexpanded 64. It can store a maximum of 12 programs (sequential and relative files are not supported), has a storage capacity of 23,551 bytes (92 blocks), and lets the user SAVE, LOAD, SCRATCH, and view the DIRECTORY.

The following commands are added to BASIC. All are preceded by the back arrow symbol and all except the Directory command require a six character filename enclosed in quotes:

← LOAD"FILNAM"	LOAD a file
← SAVE"FILNAM"	SAVE a file
← !"FILNAM"	SCRATCH a file
← \$	View DIRECTORY

The load command loads into the start of BASIC memory, even if it has been moved up. In direct mode it will set the start of variables to its end. In program mode it will start to run without disturbing any variables left in memory by the program which loaded it.

The save command works like a normal SAVE of a BASIC program: it uses the start of BASIC (43/44) and start of variables (45/46) pointers to find the start and end of the program to be saved.

The scratch command erases only the program specified.

The directory command clears the screen and prints a list of the files in RAM storage.

All the commands will work within BASIC programs, so it's possible to have up to 12 programs sharing the same variables and loading one another as necessary. The new commands should be preceded by a colon if used in an IF/THEN statement, or a SYNTAX ERROR will occur. In DIRECT MODE more than one command can be entered, for example: ← \$:LIST or ← LOAD"FILENAME":RUN.

64 RAMDrive uses the following error messages:

?MISSING FILENAME: There must be a six character filename in quotes; no graphics or control characters.

?FILE NOT FOUND: The program is not in the RAMDrive; check your spelling or the directory.

?FILE OPEN: The filename is already being used.

?TOO MANY FILES: Either the disk or the directory are full.

These error messages are "borrowed" from BASIC, so they will only have the above meanings when using one of the new commands.

COMPATIBILITY

64 RAMDrive is primarily for use with BASIC programs and machine language source code, although it does reside well with some machine language programs: *METABASIC*, *PAL*, *Power*, and *Supermon* for example. It uses the RAM under the ROM chips, from 40961 (\$A001) to 64512 (\$FC00), for program storage. The RAM from 64513 (\$FC01) to 65535 (\$FFFF) and 150 bytes in either the cassette buffer or the top of BASIC RAM is used for its code and the directory.

The BASIC loader program offers a configuration menu which allows the user to set up the RAMDrive program to suit his or her needs. The ML is in the form of data and can be relocated in either the cassette buffer or the top of BASIC RAM. There is a choice of two storage area sizes, the full 92 blocks or 44 blocks (11,264 bytes) with the storage starting at 53248 (\$D000) leaving 40961 to 53247 for machine language, high-resolution screens, or RAM-resident BASIC. Programs that use the RAM under the Kernal ROM or Input/Output chips will not be compatible. The back arrow character can be changed to a number symbol for compatibility with the *Fast Load* cartridge from Epyx.

USING IT

Loading, running, and working on small to medium sized BASIC programs is made easy when programs of up to 92 blocks can be saved and loaded in one second or less. Tape users especially could benefit. With a total storage of 61K, including BASIC RAM, copying programs is made easy. It's possible to write programs in modular form, chaining the modules in from the RAMDrive, leaving a larger storage area available for variables while dispensing with waiting for the disk drive.

Saving programs from the RAMDrive to tape or disk can be done with a single line command, for example:

#LOAD"PRGRM1":SAVE"PROGRAM 1",8

SEE PROGRAM LISTING ON PAGE 104

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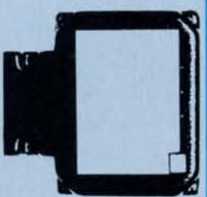
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By John Krutch



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You are vacationing on a far away planet with a strange sounding name when disaster strikes. In a public place, you take an action which seems innocent enough to you—but the natives you appear to be committing an unspeakable blasphemy against their religion. Outraged, the natives seize you and throw you in jail.

You are offered a choice of two punishments: either you must undergo the hotfoot torture, or you must watch 100 consecutive episodes of *Wheel of Fortune*. Being of sound and sane mind, you immediately decide on the hotfoot torture, even though you're not quite sure what it entails.

You soon find out. Barefoot, you must hop on one foot over a series of tiles. Each tile is either white, yellow or red, indicating the temperature of the tile. A white tile is cool; when you hop on it your foot isn't harmed. A yellow tile is warmer but not dangerously so; when you land on it your foot will sustain only minor injury. A red tile is dangerously hot. When you land on a red tile, your foot will sustain serious injury.

As you hop through the tiles, you can monitor the temperature of your foot by watching the thermometer to the left of the screen. When your foot comes in contact with a yellow tile, the thermometer indicator will rise one notch. When it comes in contact with a red tile, the indicator will rise six notches. Avoid red tiles whenever you can! When the indicator rises all the way to the top of the thermometer, your foot is so badly burned that you can't go on, and the game is over.

You score one point for each row of tiles you pass. At the start of the game, you must hop your way through 70 rows of tiles, all of them randomly changing temperature. If you should make it all the way to the last row of tiles before your foot burns up, you're allowed to rest until your foot cools back to normal. Then you're forced to start over again—but this time you must make your way through an additional seven rows of tiles. Moral: don't blaspheme alien religions.

Hotfoot is a game for the Commodore 64. A joystick must be plugged into Port 2. Push the joystick left, right, up, or down to move the foot in the corresponding direction.

Flankspeed (page 95) is required to enter *Hotfoot*. To load *Hotfoot*, type LOAD "filename",8,1 (disk) or LOAD "filename",1,1 (tape). Then type SYS 49152 to start the program.

SEE PROGRAM LISTING ON PAGE 110

PHOTO: MICHAEL R. DAVILA



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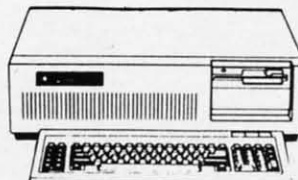


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PIRATES

MicroProse

Commodore 64

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Clench your dagger between your teeth, set your hat at a rakish angle, and cast off for the uncharted waters of seafaring adventure with super-designer Sid Meier. Best-known for his outstanding work on flying simulations and wargames, Meier demonstrates awesome versatility with this challenging action-strategy game about buccaneering in the Caribbean in the 17th century.

Those who think of the phrase "role-playing" as inevitably preceded by the adjective "fantasy" will find *Pirates* an eye-opener. This is a complete gaming system which allows the solitary player to vicariously experience pirate life to the full.

Although Meier includes sequences for sailing and swordfighting, *Pirates* isn't just an arcade contest. Even these action-oriented interludes place a greater demand on fast thinking than on rapid reflexes.

It takes real skill to steer ships, par-

ticularly when the wind swings around to an inconvenient direction. The computer provides lots of assistance with seamanship at the easiest difficulty setting ("Apprentice"), but offers no crutch when difficulty is raised to the limit ("Swashbuckler").

Swordplay, too, requires more thinking than is obvious at first. It differs from most other hand-to-hand fighting games in that the gamer orders combinations of moves, rather than specific strokes. This makes the battles seem less chaotic and makes them more fun to watch.

The game gives a choice of three blades: the rapier, the cutlass, and the longsword. Each has unique characteristics and requires a specific approach. The documentation counsels newcomers to begin by wielding a cutlass, because of its hitting power, before advancing to the more demanding rapier.

A few "mini-game" scenarios simulate a single famous raid from the pages of history, but *Pirates* is primarily a campaign game. The computerist picks a time period, difficulty level, nationality, and a special skill such as fencing ability or medical knowledge. By

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Some days, it just doesn't pay to get out of your dank, rat-infested berth.

guiding the character through a series of episodes, which can be saved to disk, the gamer helps him prepare for a sumptuous retirement. The more money, lands, and honors the buccaneer accumulates, the higher his estate in life once he abandons his nautical career.

The game system is visually interesting and fairly easy to manipulate. Decisions are facilitated by onscreen menus, and the action segments operate with joystick order-entry.

MicroProse's long experience with explaining fairly complicated programs to gamers stands the company in good stead here. The 90-page book included with *Pirates* provides a thorough explanation of every phase of activity as well as cogent historical notes which establish a rich context for the game-action.

Pirates is an unusual game, a breed apart from the fantasy quests and hard-boiled detective stories which have dominated computer adventuring for the last two years. Dare to be differ-



Some of Pirates' places and faces.

ent: *Pirates* is a computer gaming experience which should not be missed.

MicroProse, 120 Lakefront Dr., Hunt Valley, MD 21030 (phone: 301-771-1151).
—Arnie Katz

DAN DARE, PILOT OF THE FUTURE
Amazing Software/Electronic Arts
Commodore 64
Disk; \$19.95

The solo adventurer must analyze and solve a series of physical puzzles to guide the hero through a four-phase plot in *Dan Dare, Pilot of the Future*. Applying the same powers of observation to the product itself suggests that

the saying "you can't tell a book by its cover" is not as true for software as for printed matter.

No one who carefully studies the cover could possibly be surprised by *Dan Dare, Pilot of the Future*. The album-style package reveals, albeit inadvertently at times, a great deal about the program it contains.

The prominent starburst blurb suggests much of both the good and the bad with its four fateful words: "England's #1 software hit!" Veteran computer gamers can easily guess that *Dan Dare* is a typical British "top 40" hit. And that, as all familiar with U.K. software know, means yet another beautifully programmed permutation of *Impossible Mission* (Epyx).

It also explains why Electronic Arts, which recently started the Amazing Software budget brand, would base a whole game on a comic book character who is totally unknown to 99% of Americans. Publishers adore proven sellers, no matter how, where, and why they succeeded.

Fortunately, *Dan Dare* is a delightful joystick-operated graphics adventure. Even those who can't appreciate the detailed simulation of the science fiction comic will enjoy the fast-paced action, challenging situations, and charming artwork.

Of course, some of the nuances fly right over the heads of U.S. players. True fans of Frank Hampson's character will marvel over Strikey, Dan's alien pet. Excellent artificial intelligence keeps this charmingly animated little creature ceaselessly following in the fu-

turistic hero's wake. For most stateside computerists, though, it is "merely" an unusual and charming game-element of no special significance.

A television show about Space Fleet Captain Dan Dare ends on a sour note when Mekon, his old enemy, sends an asteroid with an atomic bomb hurtling toward the Earth. Failure to meet his demands spells certain doom for the entire planet.

Dan and his friends rocket to the asteroid. When they separate to explore, Mekon captures Professor Peabody and Digby.

As the interactive portion of the game begins, Dan and the faithful Strikey must search the rocky surface to find entrances to the subterranean complex. Once underground, the hero tries to rescue his two friends from the prison complex, fire a laser which destroys the asteroid's computer guidance system, and lob one of his grenades at Mekon's control dome.

Treen warriors, minions of the Green Fiend, patrol the passages which honeycomb the asteroid. Hand-to-hand combat is the only way to get rid of these defenders, and some of them aren't especially easy to kill.

The gamer does everything with the joystick. When Dan Dare moves close to an object, a message in the lower left corner explains the situation. The user holds down the action button and moves the stick to toggle among a set of windows. Each represents one possible course of action. Releasing the button implements the visible window.

The joystick also controls Dan dur-



The tunnels and other background features in *Dan Dare* appear flat compared to the foreground graphics. Dan and the other characters are colorful, detailed, and well-animated.
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44 **AHOY!**

ing fight sequences. Holding the button while pushing the joystick forward causes Dan to aim a blow at the Treen's head, while pulling it back orders a body punch.

Grenades are Dan Dare's most powerful weapon. Holding the button and pointing the stick makes him toss one in the indicated direction. The supply is limited, however, and it takes quite a few to destroy Mekon's dome.

The foreground graphics are superior to the rather flat depiction of the tunnels and other background features. Dan, Stripey, and other characters, though shown in simple side perspective, are colorful, detailed, and very well animated.

The boxing sequences aren't convincing. The arms are too short to move realistically, so fights do not have the balletic grace of a Jack Kirby punch-up.

Dan Dare, Pilot of the Future is the first title in the Amazing Software line. It is a fast-paced, playable game at a reasonable price. The theme is not as accessible as some to the American audience, but it's hard to resist such a charming action adventure program.

Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404 (phone: 415-571-7171).

—Arnie Katz

THE SENTRY

Firebird

Commodore 64

Disk; \$39.95

Get ready for another blockbuster from the publishers of *Elite*. *The Sentry* is a strategic contest with science fiction overtones, lots of visuals, and almost unlimited play potential thanks to its 10,000 racks, or "landscapes."

A sort of three-dimensional chess game, *The Sentry* begins when the player selects one of the 10,000 landscapes. (A special rack makes the game easier for first-timers.) The computer produces a two-thirds aerial display and gives the player a chance to study the board before teleporting into a robot on the landscape's surface.

The player now sees a robot's eye-view of the surface, and must wage a battle of wits with the current occupying force, the Sentry and its minions (Landgazers and Meanies). The basic currency of this conflict is energy. Each landscape contains a fixed amount of

energy, displayed in terms of trees (1 unit) and boulders (2 units). Robots are worth 3 units and the Golden Robot (the one being occupied by the player) is worth a whopping 15. The player can use the robot's ability to absorb and redistribute energy to arrange the landscape in a more favorable alignment.

For example, the player could absorb a boulder and create two trees (good for obscuring one's position from the Sentry and Landgazers); or absorb four trees and create two boulders (which can be stacked, and a robot placed atop them to obtain a better view of some object on the landscape). The trick: to absorb an object's energy, the player must be able to fix his robot's sights directly on the square it occupies.

A landscape can be conquered by absorbing its Sentry, but to do that, the player's robot must be able to see it. The Sentry and its thugs, meanwhile, are looking to absorb you, and any movement or action (other than simple panning) gives away your position. Of course, they too must be able to see not only you (a half-scan) but the square you occupy (a full-scan). When the Sentry can only obtain a half-scan, it sends out its Meanies to flush you into a more vulnerable position.

To beat the Meanies at their own game, the player must "hyperspace," that is, create a new robot in a random position on the landscape and automatically transfer the player's consciousness to it, leaving the shell of the old robot behind. While the Meanie focuses on the shell, the player can absorb it from his new position.

The Sentry is just loaded with this sort of strategic nuance. It's the kind of game that engenders a devoted cult following, and it would not be surprising (or unwelcome) to see Sentry tournaments springing up. The graphics, while hardly of coin-op quality, are rather compelling and quite adequate to the task. *The Sentry* is an instant classic, an innovative blend of strategy and action ("straction") that should stir the blood of any game-player.

Firebird Licensees, P.O. Box 49, Ramsey, NJ 07446 (phone: 201-444-5700).

—Bill Kunkel

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See page 62.

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This game is really bizarre and a heckuva lot of fun. It's like "Lord of the Rings" and "Monopoly" mixed together in one big smelting pot. It's also the sort of game you'll only see in the pages of *Ahoy!*, because it's a real change of pace from "kill the monster, get the treasure" type adventure scenarios. You may find it an unsettling course in economics as well. I admit this game is a result of some reading I have been doing lately in that field.

Originally these graphics were part of a C-64 game I was working on that was intended for commercial publication. But that project, called *Adventuron*, grew too similar to other games of its ilk and I scratched it in favor of this game. The result is a very aesthetically pleasing blend of text and graphics.

The setting for the game is a huge map of the world of *Empire*, a fantasy never-never land. This map contains the kingdoms of eight different warring factions.



Each of the kingdoms comprising the Empire has its own entrance. Once inside, you'll get a menu of options; pick Buy or Sell, and you'll see the menu above.

Buy
Sell
Seasonal Changes
Inquire
Inventory
Bid Farewell

From this menu you can select any option by moving the highlighted bar with the joystick and pressing the fire button.

If you select Buy or Sell, you'll be able to purchase goods with the \$500 starting money you're given. You also have \$5000 worth of credit extended to you by the Merchant's Guild in the form of debt notes. You cannot purchase land



You will be in the middle of this war and attempt to profit from it, because you are a traveling merchant.

The goal of the game is to acquire 100% of the Empire within one year. Each kingdom owns a separate portion of the Empire, and you will attempt to buy out their land shares with the profits you'll make wheeling and dealing in the various population centers.

To move around on the master map, you'll need a joystick plugged into Port 2. You can move anywhere you want in the Empire, including across bodies of water or rough mountainous terrain. Your little man will change to a figure on a horse or in a canoe when you cross either of these.

Each kingdom has an entrance. To enter the kingdom, move your man to this doorway and squeeze the fire button.

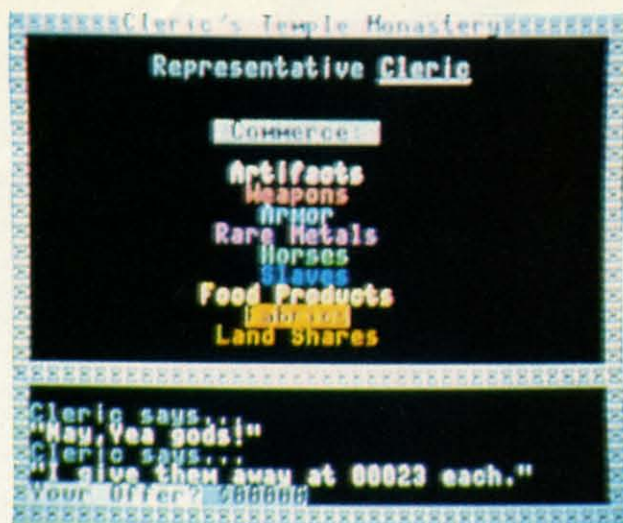
The screen will present a menu of options once inside:

with debt notes, but you can buy goods to sell for profit, if you deal wisely to recover your losses.

There are nine types of trade commerce in the Empire:

1. Artifacts (religious items, antiques)
2. Weapons (swords, spears)
3. Armor
4. Rare Metals (gold, silver)
5. Horses
6. Slaves
7. Food Products (grain, rice, corn, etc.)
8. Fabrics (clothing, drapes)
9. Land Shares (deeds to individual furlongs)

Your year of trading is divided into four separate seasons. Each of these seasons is denoted by a change in the border color of the map: green for spring, yellow for sum-



Don't bargain so long that the Monk quits in frustration.

mer, brown for fall, and white for winter.

The Merchant's Guild fixes prices for each of the eight goods above quarterly. Each of these set prices is modified by different seasons of the year; for example, food products are in high demand during the winter, along with fabrics, because of the cold and starvation that occurs at this time of year. Because the products are in greater demand, people will pay higher prices for them. If you buy up these products during the summer (when they are cheap) and hoard them until winter, you can sell them at tremendous profits.

By selecting seasonal changes from the menu, you can see the gains or losses experienced each season for the product and adjust your purchases to benefit the most from this



There are nine different types of commerce in the Empire.

knowledge.

The kingdoms each have different needs for the products, and you may get more than the base price set by the Guild if you are a clever bargainer. Your goal, of course, is to buy the products at the lowest possible price and sell them for the most you can get.

You'll still use the joystick for numeric input. Up and

down will decrement or increment the numbers by tens respectively, and left and right decrease or increase the numbers by ones. Push the fire button to enter your offer.

Each kingdom makes its own individual product, so it will have no need to purchase any from you. However, each kingdom is the only source for the product it turns out, and you will have to find out through deduction and trial and error which product that is. Selecting Inquire from the menu will inform you of the current demand for the product in that particular kingdom, and the base price set for it by the Guild. Once you find out what product the inhabitants deal in, you will want to hawkswoogle them down to the lowest price you can. Their first selling offer will be ridiculously high, of course—but you can bring this price down by carefully bidding close (not too close, though).

For example, if the Monk offers to sell you 110 fabrics at \$95 apiece (base price \$40), offer him \$85 instead. If he comes down a little, try to give him \$69 apiece. The goal is to bicker him down to less than \$40, the base price, while he curses and remonstrates against your tightfistedness. If you manage to get him below \$25, you can resell the goods to another kingdom where they are in high demand at an enormous profit. Be careful not to bargain too long with him, or he will utter a snarl and break off from negotiations altogether in frustration.

To sell your wares, you will want to bid close to his first low offer, then slowly nudge the price up (complaining of your overhead and expenses) until you lure his offer up past the base price and into the big bucks take-the-money-and-run regions.

The Inventory command shows you how much of each product you are carrying and how much cash you have on hand, if you should forget.

To leave the location you are currently in, select Bid Farewell from the menu. You will be back outside, on the master map. You cannot enter that kingdom again until you have visited at least one other.

You will probably spend the spring in debt, but come summer it will be time to start thinking about buying some land. Hopefully you will be out of debt and have lots of capital by this time, so you should start acquiring some property.

If you play with great cunning, you may own all or almost all of the Empire by the time the end of the year rolls around, which takes anywhere from 20 to 30 minutes of gameplay in real world time. The ecological clock stops dead while you are inside the kingdoms, so this could vary greatly from session to session.

At the end of winter, your inventory board will appear, along with your current cash holdings, and the percentage of the Empire you own at year's close.

The listing is in BASIC 7.0 and uses some really keen character animation to make the Empire oceans shimmer, flags wave in the breeze, and volcanoes erupt. Be sure to save a copy of the program before running it, however, since it uses a small machine language subroutine to copy the character data down to the graphics screen.

Good luck. The unwashed masses are hungrily awaiting your visit to their kingdom! □

SEE PROGRAM LISTING ON PAGE 106

Compiled by Michael R. Davila

Contributors to *Tips Ahoy!* will be compensated at highly competitive industry rates immediately upon acceptance. Send your best programming and hardware hints to *Tips Ahoy!*, c/o Ion International Inc., 45 West 34th Street, New York, NY 10001. Include a stamped and self-addressed envelope if you want your submissions returned.

PHASE-IN

Phase-In is a short relocatable machine language program for the C-64 and C-128 that causes a rippling effect on the high resolution bit mapped display. I tried to make the program as flexible as possible. To relocate the machine language routine, simply set variable S in line 2 to the new location. Those of you who wish to relocate the bit map display must change the value of variable BM in line 3 to the new starting location.

—Michael Jaecks
Alamogordo, NM

```

•1 REM PHASE-IN
•2 S=4864:REM START ADDR. FOR ML STORAGE
•3 BM=8192:REM START ADDR. OF BIT MAP
•4 FORI=0TO59:READA:POKES+I,A:B=B+A:NEXT
•5 IFB<>9091THENPRINT"ERROR IN DATA STATE
MENTS!":END
•6 HI=INT(BM/256):POKES+3,BM-HI*256:POKES
+7,HI:BM=BM+7999:HI=INT(BM/256)
•7 POKES+47,BM-HI*256:POKES+53,HI
•8 PRINT:PRINT"SYS"S"TO ACTIVATE"
•10 DATA 162,8,169,0,133,251,169,32,133
•20 DATA 252,160,0,177,251,72,160,7,177
•30 DATA 251,72,136,208,250,160,0,104
•40 DATA 145,251,200,192,8,208,248,165
•50 DATA 251,24,105,8,133,251,144,2,230
•60 DATA 252,165,251,201,63,144,216,165
•70 DATA 252,201,63,144,210,202,208,199
•80 DATA 96
    
```

READY OR NOT

Ever spend hours writing or debugging a program? At those times it seems the only thing you can be sure of is the READY prompt staring you in the face. Wouldn't it be nice if it could say something else? Maybe RELAX!

With *Ready or Not* you can change the READY prompt to whatever you like, up to six characters in length. Change it to your name or to a design using the keyboard graphics. I like to press (CTRL 8) BUCK (CTRL 1). Then, instead of READY, my name is displayed in yellow and whatever I type is printed in black. You can have your customized prompt displayed in reverse video (CTRL 9), also. If you're the generic type that likes plain brown wrapper, how about changing it to PROMPT?

After saving *Ready or Not*, you can load and run it like any other program. The BASIC loader POKES the machine

language data into memory and checks for errors. You can then activate it by typing SYS 53000 and pressing RETURN. READY. will appear on your screen (as a six character guideline, counting the period) with the cursor below it. Enter your name, or whatever, hit RETURN, and presto! (If you make a mistake, press INST/DEL.) Your customized prompt has replaced READY. SYS 53000 anytime you want to change it.

Ready or Not can be relocated by changing S in line 2.

—Buck Childress
Salem, OR

```

•1 PRINTCHR$(147)"LOADING[3"."]":PRINT
•2 S=53000:REM *** CHANGE S TO RELOCATE *
**
•3 FORJ=STOS+119:READA:POKEJ,A:X=X+A:NEXT
J
•4 IFX<>18560THENPRINT"ERROR IN DATA[3"."
]":END
•5 PRINT"THE DATA IS LOADED[3"."]":PRINT:
PRINT"SYS"S"TO CHANGE THE PROMPT[3"."]":
END
•6 DATA169,160,162,0,160,224,133,252,134,
251,132,254
•7 DATA161,251,129,251,230,251,208,248,23
0,252,200,208
•8 DATA243,162,55,208,64,32,68,229,169,11
8,160,163
•9 DATA32,30,171,169,32,162,5,157,120,163
,202,16
•10 DATA250,134,212,232,134,198,134,204,1
34,253,32,228
•11 DATA255,240,251,201,13,240,20,201,20,
240,210,166
•12 DATA253,224,6,176,237,157,120,163,32,
210,255,230
•13 DATA253,208,227,169,0,162,54,133,254,
169,47,120
•14 DATA133,0,134,1,88,169,32,32,210,255,
165,254
•15 DATA208,175,133,207,169,13,76,210,255
,0,0,0
    
```

H-ALT

H-ALT is a relocatable machine language utility for the C-128 that enables you to pause the computer's operating system. By hitting the ALT key, you can pause most functions enabled by the computer. However, I did not intend for this utility to replace the NO SCROLL key. When CATALOGing a disk, be sure to use the NO SCROLL key to pause. To continue the normal operations, simply hit any other key. Incorporating this utility in your games can make them even more enjoyable.

—Michael Jaecks
Alamogordo, NM


```

•1 REM H-ALT
•2 REM HIT THE ALT KEY TO PAUSE
•3 REM HIT ANY OTHER KEY TO CONTINUE
•10 S=4864
•20 FOR I=0 TO 29: READ A: POKES+I, A: B=B+A: NEXT I
•30 IF B<>3680 THEN PRINT "ERROR IN DATA STAT
  EMENTS!": END
•40 HI=INT((S+13)/256): LO=S+13-HI*256: POKES+2, LO: POKES+7, HI
•50 PRINT "[CLEAR]SYS" S "TOENABLE": PRINT "HI
  T RUN/STOP AND RESTORE TO DISABLE"
•60 DATA 120, 169, 13, 141, 20, 3, 169, 19, 141
•70 DATA 21, 3, 88, 96, 169, 8, 197, 211, 208
•80 DATA 8, 32, 159, 255, 32, 228, 255, 240, 248
•90 DATA 76, 101, 250

```

DUO-PRINT

This handy little utility displays a hex dump of a given memory area. What makes this so special is that it doesn't waste paper as a 1 column printout would. It utilizes the far right side as well as the left side of the paper. This saves a lot of paper when making a hex dump. Just enter the starting and ending addresses (in decimal) when they're asked for. The computer will print out to the printer (device #4) in 2 columns. This saves time and paper. —John Fedor
Lindenhurst, IL

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Merlin 128 requires a Commodore 128 and at least one 1571 drive or equivalent. Merlin 128 is compatible with Merlin 64 source files.

```

•5 H$="0123456789ABCDEF"
•10 INPUT "[CLEAR]ENTER STARTING ADDRESS "
  ;A1
•20 INPUT "[CLEAR]ENTER ENDING ADDRESS ";A
  2
•30 IFA2<A1 THEN 10
•40 S1=A1: S2=INT((A2+A1)/2)
•55 IFA1-INT(A1/8)*8<>S2-INT(S2/8)*8 THEN S
  2=S2+1: GOTO 55
•60 E1=S2-1: E2=A2
•70 PRINT "[CLEAR]"
•75 OPEN 4, 4: CMD 4
•80 IFS1>E1 THEN PRINT SPC(30);: GOTO 95
•90 A=S1: GOSUB 600: FOR I=0 TO 7: A=PEEK(S1+I):
  GOSUB 700: NEXT I
•95 PRINT SPC(10): IFS2>E2 THEN 110
•100 A=S2: GOSUB 600: FOR I=0 TO 7: A=PEEK(S2+I):
  GOSUB 700: NEXT I
•105 PRINT
•110 S1=S1+8: S2=S2+8
•115 IFS1<=E1 OR S2<=E2 THEN 80
•120 PRINT #4, "": CLOSE 4: END
•599 REM
•600 C=INT(A/4096): PRINT MID$(H$, C+1, 1);: A
  =A-4096*C
•605 C=INT(A/256): PRINT MID$(H$, C+1, 1);: A=
  A-256*C: C=INT(A/16)
•610 PRINT MID$(H$, C+1, 1);: A=A-16*C: PRINT M
  ID$(H$, A+1, 1)": "": RETURN
•700 C=INT(A/16)
•705 PRINT MID$(H$, C+1, 1) MID$(H$, (A AND 15)+
  1, 1)": "": RETURN

```

RADAR 128

This program for the 128 is a simulated naval radar which could be used in some kind of sub-based game. It uses one sprite for the blip. The routine first draws a circle the hard way in order to be able to store the points in an array for callback later. This program can easily be implemented into a program; for example, the program could control where the sub is and plot it on the radar easily by defining the variables, SA for the angle and SD for the distance from the boat or sub. The best speed at which the radar turns is between 10 and 20. Anything below 5 and it takes forever to go around.

—William Eisenhauer
Beaverton, OR

```

•1 GOSUB 26
•2 COLOR 1, 1: COLOR 4, 2: COLOR ., 2
•3 SPRITE 1, ., 7: MOVSPR 1, 142, 140
•4 SCNCLR: GRAPHIC 1, 1: GRAPHIC 0, .
•5 INPUT "ENTER SPEED (1-SLOW 30-FAST):"; SP
  : INPUT "ENTER SUB DISTANCE FROM CENTER"; SD
  : INPUT "ENTER ANGLE (NORTH-0)"; SA
•6 INPUT "ENTER RADAR SIZE"; SZ
•7 MOVSPR 1, SD; SA: REM SPOT SUB
•8 DIMX(360), Y(360)
•9 :

```



```

•10 REM DRAW RADAR FRAME
•11 :
•12 FORT=0TO360:LOCATE130,100
•13 DRAW0,SZ;T:X(T)=RDOT(0):Y(T)=RDOT(1)
•14 DRAW1
•15 NEXT:GRAPHIC1,..:CHAR1,14,1,"RADAR":DO
•16 :
•17 REM LOOP TO SPIN NEEDLE
•18 :
•19 FORT=0TO360STEPSP
•20 DRAW1,130,100TOX(T),Y(T)
•21 IF(T+SP>SA)AND(T-SP<SA)THENSOUND1,200
  00,10,0,20000,2,0:SPRITE1,1,7:FORQ=1TO20
  :NEXT:SPRITE1,0,7
•22 DRAW0,130,100TOX(T),Y(T):DRAW1,X(T),Y
  (T):NEXT:LOOP
•23 :
•24 REM SUBROUTINE TO MAKE RADAR BLIP
•25 :
•26 FORG=3584TO3647:POKEG,0:NEXT:POKE3609
  ,24:POKE3612,60:POKE3615,60:POKE3618,24:
  RETURN

```

BYTES 'R' US

When you eat a sandwich, you take bites. If you munch down some popcorn, you take bites. By the same token, when you enter a program, you take bytes. Let's face it, bites and bytes are a fact of life—*Bytes 'R' Us!* If, like me, you frequently like to know how much you're packing into Ol' Reliable's waistline, try *Bytes 'R' Us*.

Bytes 'R' Us instantly tells you the number of bytes your BASIC programs are taking. There's a version for the C-64 and C-128.

Just load and run *Bytes 'R' Us*. It will remain undisturbed in a free area of memory while you load, save, or work on your BASIC programs.

To use *Bytes 'R' Us*, type SYS 700 for the C-64 or SYS 3072 if you're on the C-128. Now press RETURN. Presto... you'll immediately see how much weight your masterpiece has gained or lost!

Both versions can easily be relocated if you want. All you have to do is change the variable S in line 2 to your new starting address.

—Buck Childress
Salem, OR

C-64 VERSION

```

•1 REM *** BYTES 'R' US (64) ***
•2 S=700:REM CHANGE S TO RELOCATE
•3 PRINTCHR$(147):PRINT
•4 FORJ=STOS+23:READA:POKEJ,A:X=X+A:NEXTJ
•5 IFX<>3448THENPRINT"ERROR IN DATA[3"."]
  ":END
•6 PRINT"DATA OK. SYS"S"FOR BYTES[3"."]
  :END
•7 DATA166,43,232,232,134,251,165,45,56,2
  29,251,170
•8 DATA164,46,176,1,136,152,56,229,44,76,
  205,189

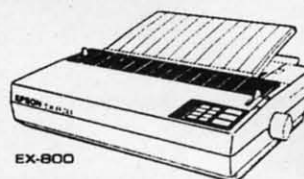
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C-128 VERSION

```

1 REM *** BYTES 'R' US (128) ***
2 S=3072:REM *** CHANGE S TO RELOCATE
3 PRINTCHR$(147):PRINT
4 FORJ=STOS+28:READA:POKEJ,A:X=X+A:NEXTJ
5 IFX<>3513THENPRINT"ERROR IN DATA[3].]"
  :END
6 PRINT"DATA OK. SYS"S"FOR BYTES[3].]"
  :END
7 DATA32,69,168,166,45,232,232,134,251,1
  73,16,18
8 DATA56,229,251,170,172,17,18,176,1,136
  ,152,56
9 DATA229,46,76,50,142

```

C-64 ALL-RAM SAVER

The RAM under the Kernal (57344-65535) is a good place to put any type of data like hi-res graphics, sprites, etc., because BASIC doesn't use it. But what happens if you want to save this memory? To read it you have to turn off the Kernal and therefore cannot use its save routine. None of the programs I know solve this problem either, so I wrote *All-RAM Saver*; it can save any of the 65536 RAM bytes of your computer to disk. To use it, type the program below and run it. To save any portion of RAM just type the following command:

SYS AD,"Filename,P,W",starting address of
f save,ending address of save

where AD is the machine language beginning address of *All-RAM Saver*. The default value is 828 but you can change it anywhere in memory by changing the value in line 10. *All-RAM Saver* is very similar to *Data Express* (July '87), so read the article to learn about uses of the program. As an example, suppose we want to save a hi-res graphic from *Simons' BASIC* (located under the Kernal) under the name of 'draw'. Enter:

SYS 828,"DRAW,P,W",57344,65535

To load it: LOAD "DRAW",8,1. —Christian Castor
Mexico City, Mexico

```

10 AD=828:FOR A=AD TO AD+110:READ B:POKE
  A,B:CK=CK+B:NEXT
11 IFCK<>15696THENPRINT"ERROR IN DATA":S
  TOP
12 DATA 032,253,174,032,087,226
13 DATA 169,008,133,186,169,104
14 DATA 133,185,032,213,243,165
15 DATA 186,032,177,255,165,185
16 DATA 032,147,255,032,253,174
17 DATA 032,138,173,032,247,183
18 DATA 165,020,133,251,032,168
19 DATA 255,165,021,133,252,032
20 DATA 168,255,032,253,174,032
21 DATA 138,173,032,247,183,165
22 DATA 001,072,165,020,072,166
23 DATA 021,120,169,000,168,133
24 DATA 001,177,251,160,055,132
25 DATA 001,032,168,255,104,072
26 DATA 197,251,208,004,228,252
27 DATA 240,008,230,251,208,227
28 DATA 230,252,208,223,104,104
29 DATA 133,001,032,174,255,032
30 DATA 066,246,096

```

TWO COLOR BORDER

Here's a program that lets you have a two-color border, split horizontally in the center. To change the colors just replace the second number in lines 80 and 90 with another number from 0 to 15.

—Brian Ostergren
Madison, WI

```

10 REM TWO COLOR BORDER
20 FOR I=828 TO 892:READ A:POKEI,A:NEXT
30 SYS828
40 REM CHANGE THE SECOND NUMBERS IN LINE
  S 80 AND 90 FOR DIFFERENT COLORS
50 DATA 169,27,141,17,208,169,127,141,13
  ,220,169
60 DATA 86,141,20,3,169,3,141,21,3,169,1
  29
70 DATA 141,26,208,96,169,1,141,25,208,1

```

Continued on page 114



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EARL WEAVER BASEBALL

Electronic Arts

Amiga (512K)

Disk; \$49.95

The most feature-laden computer baseball game ever coded raises a provocative question: Can a program attempt too much for its own good? *Earl Weaver Baseball* is an exceptionally fine product, but it's hard to shake the feeling that it would have been even better if author Eddie Dombrower hadn't tried to touch all the bases at once.

The World's Greatest Baseball Game (Epyx), designed by Quest, Inc., features an arcade contest and a statistical simulation in one package. Unfortunately, the limitations of eight-bit technology handicap both components of *World's Greatest* compared to more focused baseball games of the same period. The graphics pale beside *Star League Baseball* (Gamestar), while the mathematical model doesn't measure up to *Computer Baseball* (Strategic Simulations) in detail and complexity.

Earl Weaver Baseball is the best hybrid yet published for the home computer. It actually surpasses most of the currently available specialized action and statistical baseball programs.

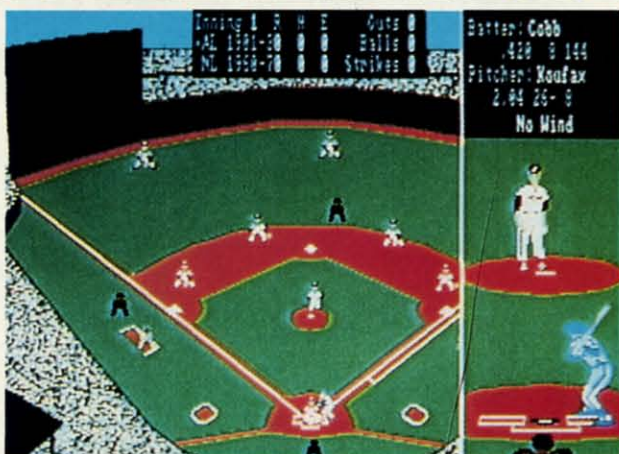
Eddie Dombrower has done a magnificent job on *Earl Weaver Baseball*. He has integrated a lot of great manager's philosophy into this design, which gives it unmatched realism. Yet as with *World's Greatest Baseball Game*, combining action and stat applications forces some aesthetic compromises.

The graphics, which would be excellent for a statistical simulation, aren't quite as good as those found in state-of-the-art action games. Conversely, smoother play-mechanics and the inclusion of more teams on the game disk would enhance the stat simulation.

The key to controlling this multifaceted, flexible program is the main menu screen which replaces the beautiful title page after booting (Note: Amiga 1000 owners must have Kickstart 1.2.) The computerist employs mouse, joystick, or keyboard to quickly set the parameters. No game rivals *Earl Wea-*



Author Eddie Dombrower, shown with diamond legend Earl Weaver, combined the best of action-oriented and statistic-based baseball games into an exceptionally fine product.
READER SERVICE NO.



ver Baseball in this respect. The options and adjustments are, literally, too numerous even to list here. Some of the more interesting ones: four difficulty levels, a robot "Earl Weaver" for both the arcade game and the simulation, utilities for compiling new teams and leagues, databases of actual player stats or performance in a designated group of computer games, historical and customized stadiums, and a choice of pitch-by-pitch or at-bat summary play.

For those who elect to concentrate on the arcade version, there's an excellent "practice" setup. Unlike most games, *Earl Weaver Baseball* provides more than just a batting cage. It is possible to hone skills in fielding, pitching, and even baserunning as well as

hitting. The command control system is no snap, so this multifaceted mode is a great way to get novices up to competitive speed.

The game disk includes a selection of eight all-star teams: National League (NL) 1900-1930, American League (AL) 1900-1930, NL 1930-1945, AL 1930-1945, NL 1946-1960, AL 1946-1960, NL 1961-1975, and AL 1960-1975.

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It's a good selection for those exclusively interested in old-timers, but the lack of contemporary teams is disappointing. The package includes a special offer for a discount on a disk based on the 1986 season.

The main display shows a view of the entire field with home plate near the bottom of the screen. A large window on the right, called up by clicking the mouse button, provides an umpire's view of the pitcher-batter confrontation. Pop-up windows allow both managers to position fielders, insert substitutes, visit the mound for a conference, consult statistics, and make other strategic moves.

The onscreen athletes, though a little small, are fluidly animated and look good going through their paces. Moreover, the reactions and movements of fielders, runners, and hitters are remarkably consistent with real-life major league action.

Video tricks spice up the graphic look of *Earl Weaver Baseball*. There are instant replays, slow-motion sequences, and even frame-by-frame review. The between-innings transition is absolutely marvelous. The picture shrinks somewhat and a list of batters coming up in the next half-inning appears against a black background in the lower right corner of the screen.

The audio is similarly sensational. Teri Moran, wife of the main designer, shows a real flare for music and sound effects. From the opening rendition of "Stars and Stripes Forever" which accompanies the loading procedure to the digitized voice which announces each batter, *Earl Weaver Baseball* really sounds like a day at the ballpark.

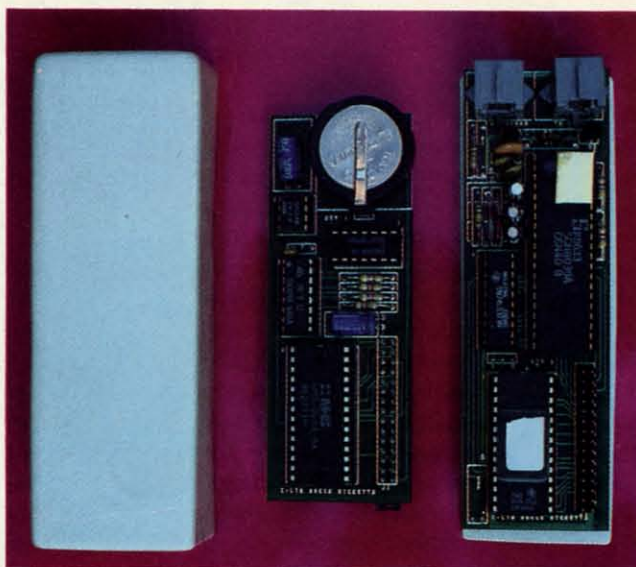
Could this product have turned out even better? Yes, it could have. Electronic Arts might have developed two separate games, one action and the other stat simulation, and pushed each to even greater heights.

The desire for the perfect program should not, however, blind lovers of the National Pastime to the merits of *Earl Weaver Baseball* as it stands. It may not be the last word in computer baseball, but it is currently the game against which all other electronic versions of the sport must be measured.

Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404 (phone: 415-571-7171). —**Arnie Katz & Bill Kunkel**

Inside the TimeSaver are a pair of piggy-backed circuit boards. Left to right: TimeSaver cover, top board with 3V Lithium battery, clock/calendar chip, 8K of RAM, and bottom board with microprocessor.

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TIMESAVER

C Ltd

Amiga 1000

Price: \$79.95

Its ten o'clock. Does your Amiga know what time it is? If not, maybe you should do something about it. TimeSaver from C Ltd may be just the thing to do it with.

All kidding aside, the correct time and date is an important matter as far as AmigaDOS is concerned. It is important enough that the default Startup-Sequence on the Workbench disk includes a message which reminds the user to enter the time and date via Preferences every time the Amiga boots up. The time and date information is used to time stamp all files as they are created or copied by AmigaDOS. A file's temporal statistics may be displayed by the AmigaDOS LIST command. If for some reason a file's date or time is later than what the Amiga considers to be the present, then the LIST command simply displays Future for that file. Having a disk full of Future files tended to seriously hamper AmigaDOS operations under version 1.1 of the operating system. This problem has been corrected in version 1.2.

In view of the emphasis placed by AmigaDOS on the correct chronological status of its filing system, we were puzzled by the omission of a battery-backed clock on the Amiga 1000. In fact Commodore does provide a built-in timepiece with the Amiga 2000 and the Amiga 500 when the half megabyte expansion module is installed.

C Ltd, with their TimeSaver accessory for the Amiga 1000, is seeking to rectify Commodore's original omission. TimeSaver, which contains a battery-backed clock/calendar among other things, is installed in line with the Amiga 1000's keyboard cable. Simply remove the keyboard connector from the back of the Amiga and insert it into the TimeSaver. The short length of telephone handset cable which accompanies TimeSaver completes the hookup to the Amiga. Our sample of TimeSaver was devoid of any external markings with regard to the destination for its connectors. When we popped the cover off we discovered that the connectors were labeled on the printed circuit board.

C Ltd recommends that TimeSaver be tucked into a small nook under the keyboard. Doing so will keep TimeSaver out of the way, but it will also make access difficult when it comes time to change the battery.

Once it is installed, TimeSaver is in the position to intercept all data from the keyboard before it can get to the Amiga. Whenever the Amiga is powered up, or after a warm reboot, TimeSaver issues a break CLI command in the form of a CTRL-D data byte. This interrupts the commands in the Startup-Sequence allowing TimeSaver to interject a DATE command with the current temporal data. At this point TimeSaver normally issues a command to execute the Startup-Sequence so the Amiga can finish booting in the prescribed fashion.

The result of this series of events is

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that the Amiga will have the current time and date when the bootup sequence is complete. There are some definite circumstances which may prevent the successful completion of the aforementioned sequence of events. To start with, the Workbench disk used for the bootup must have the DATE command in its c directory. If the boot disk does not open a CLI, the DATE command will not be implemented. The timing of these events is also somewhat critical. If the CTRL-D is issued too early or too late it may be ignored or the DATE command may not execute properly. In general the lack of a CLI or a TimeSaver timeout does not affect the operation of the Amiga.

The timing of TimeSaver's bootup sequence may be adjusted to suit the user. The most significant variable is how long it takes the user to insert the Workbench disk once the Amiga is finished with Kickstart. Too long a delay at this stage and TimeSaver will miss its chance. The default time delay of 11 seconds may be shortened or lengthened by the user. We found that the 11 second default value worked well with our bootup practices.

What's in a TimeSaver

TimeSaver has a lot more going for it than just a battery backed clock/calendar. Inside its 5x2x1½" package is an 8 bit microprocessor, 8 kilobytes of ROM, 8 kilobytes of static RAM, and a power supply arbitration chip in addition to the aforementioned clock/calendar. When the Amiga is turned off the contents of the static RAM and the operation of the clock/calendar is maintained by a built-in 3 volt lithium battery. This battery has a life of about one year in the TimeSaver. When the Amiga is turned on TimeSaver draw its power from the computer.

The eight kilobytes of RAM has two functions. One kilobyte is used as a keystroke buffer which stores the most recent thousand keystrokes. This data forms the basis of TimeSaver's Command Line History and Editing functions. The remaining seven kilobytes is used to store user-defined macros.

Anyone who has used the Amiga's Command Line Interface (CLI) will be well aware of its limited editing capabilities. An error anywhere in a command line forces the deletion and re-

typing of all the data following the error. Those of us who have graduated from the C-64 or VIC 20 or any of the PET computers which all come equipped with that absolutely wonderful full screen editor will also have some very strong opinions about the editing capabilities of the !#%*&*!! AmigaDOS CLI.

TimeSaver's built-in Command Line Editor goes a long way towards making life liveable with CLI. It works like this. As you enter data at the Amiga's keyboard, all keystrokes are stored in TimeSaver's 1K RAM buffer. To edit an entry simply press the HELP and Up Arrow keys, which prompts TimeSaver to start a new line with a semicolon and reprint all keystrokes back to the last RETURN. The line may now be edited by positioning the cursor and inserting or deleting characters at will. The Command Line History function lets you scroll through the 1K buffer and edit any line which is still in it. When you are done simply hit RETURN and TimeSaver reprints the edited line as if it were being typed from the keyboard for interpretation by the CLI.

TimeSaver implements left cursor movement by issuing a keystroke se-

quence consisting of ESC, [, SHIFT D. If you wish you may try this on the Amiga and watch the cursor backspace over a character without erasing it. This still does not permit line editing, as CLI treats the above character sequence as part of the command line which is being entered—hence the need to reprint the entire line consisting only of the desired text. The presence of a semicolon at the start of a command line causes the line to be treated as a comment by the CLI.

Macros Large and Small

Above and beyond the aforementioned clock/calendar and Command Line Editing functions, TimeSaver provides extensive macro facilities. For those unfamiliar with the term, a macro is simply a brief command or keystroke sequence which replaces a much longer command string. All of TimeSaver's macros are initiated by an "action key" in conjunction with one or two other keys. There are six TimeSaver "action keys" for user-defined macros consisting of the CTRL, LEFT-ALT, RIGHT-ALT, LEFT-AMIGA, RIGHT-AMIGA, and RIGHT-SHIFT keys. In addition, TimeSaver has a number of built-in functions which are

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all initiated by the HELP key.

Most of the built-in functions deal with various TimeSaver functions such as defining new macros, deleting old macros, reporting on available memory, setting the clock, and setting the TimeSaver function flags. The rest of the built-in macros consist of the most often used AmigaDOS commands. The function flags establish which TimeSaver functions will be active at any time. This lets you configure TimeSaver to avoid conflicts with your application software.

Based on the number of "action keys" and their possible keyboard combinations it is possible to define over 500 user macros. Over 7000 bytes is available inside TimeSaver for the storage of this data. It takes very little imagination to realize that conflicts with application software keystroke sequences are inevitable. The TimeSaver manual provides several ways to get around these keyboard conflicts. If you wish, all of TimeSaver's functions may be

turned off with the HELP, RIGHT-SHIFT, 0 key combination. This will leave active only the HELP, 0 key combination, which turns TimeSaver back on. We found very little that would not work with TimeSaver. In fact the only program that we could not get to work as of this writing was the Mirror copy utility.

TimeSaver has optional built-in password security, which may be a bane or a boon depending on your point of view. TimeSaver has several ways to frustrate would-be tamperers. At its most fundamental level it just sits there and displays the ";enter code" prompt every four keystrokes. The TimeSaver manual seems to feel that the password prompt consists of ";enter password" which did not agree with what we saw. If you should forget your password you will have to remove the TimeSaver battery to restore the default password, which just happens to be "cld".

For a really frustrating experience, just turn off the screen echo function.

At this point the password prompt will not appear. You will also experience difficulty getting the password right if you lose count of your keystrokes. The password function may be activated at any time with the HELP, F8 keystroke combination. This is supposed to prevent an unauthorized reset of the Amiga by a frustrated tamperer. We found that it did not seem to help. Our Amiga would reset anyway. All in all we are not terribly enthused with passwords for our own use, but if you want it TimeSaver will let you have it.

Caution

A year is a reasonably long time in the life of a computer, but it is not forever. The time to change the TimeSaver battery may come sooner than you expect. This could be a traumatic experience for the uninformed. When it happens the Amiga's keyboard will seem to lock up, which could initiate a repair call by an uninformed user. At the very least up to 7000 bytes of stored macro data will be lost if you use that feature extensively.

It is possible to change the TimeSaver battery without any loss of data if the battery's demise is anticipated. Simply remove the old battery and put in a new one while the Amiga is turned up. It would have been nice if TimeSaver warned the user via an onscreen prompt if it detected imminent battery failure.

We did express our concern about these matters to C Ltd, and they agreed that something would be done. In fact they indicated that by late summer they will supply a TimeSaver utility which will allow the user to upload or download the entire contents of the 7K RAM macro buffer to and from disk. This will be installed in the TimeSaver ROM and upgrades will be made available to existing users for a reasonable cost. They even went so far as to confirm their intentions in writing.

Conclusions

Overall we were quite pleased with TimeSaver. The clock/calendar function is most welcome, and the Command Line Editing function is a pleasure compared to what we had before. Our store of macros grows continuously while we patiently await the arrival of the upgrade ROM. Best of all we

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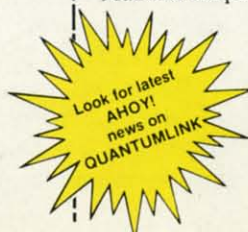
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60 AHoy!

were able to add all of these features without opening the Amiga and with a minimum impact on the execution of existing software.

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—Morton Kevelson

DIGA!

**Aegis Development
Disk; \$79.00**

It's 3 a.m. in the high stakes poker game of commercial telecommunication programs, and Aegis Development has upped the ante with *Diga!* *Diga!* sets a new standard in flexibility and ease of use in the increasingly complex world of telecommunications. In fact many of my (fairly minor) complaints about this program stem from my applying *Diga!*'s own standards to itself.

Diga! handles the basics with grace and style; even the color-cycling bootup title screen from the studios of Sachs Enterprises reflects this. *Diga!* is organized around the central metaphor of a phone book. Your phone book (and you can have more than one) contains the usual name and phone number categories as well as the more unusual general information fields and selectable baud rate. More important, here is where you access the twin keys to unlocking *Diga!*'s power: configuration and script files.

The configuration files hold a very flexible set of parameters affecting everything from color and resolution of screen to the terminal emulation and macro keys. The screen resolution, aside from the normal Amiga modes, can also be driven in "overscan" allowing you to have 24 lines (49 in interface) and still maintain a visible menu bar. *Diga!* automatically defaults to a more compact font when you select the higher resolutions. The screen has its own menu screen listing the various column and row options—if you choose a non-standard variation, 14 lines of text with 80 columns for example, you can give it a particular name like "SpacedOut" and that name will then appear in the pull-down menu under "Lines."

The quickest way to access the range of settings that most commonly need adjusting is with *Diga!*'s Fast Menu, an Aegis trademark. Unlike Animator

AMIGA SECTION

with its often cryptic icons, *Diga!*'s Fast Menu gives you a very clearly laid out screen detailing baud rate, protocol and transfer options, number of columns and lines, and 15 different varieties of "parity"—actually the word length, parity, and stop bit combination (e.g. 8N1). This menu in giant screen gadget form is available via the Help key; Aegis did a very nice job of finding keyboard equivalents for most commands.

One of the more powerful features of *Diga!* comes from its ability to load different terminal emulations. Included on disk are emulations for TTY, ANSI, Tektronix 4010/14, Dec VT100, and VT52. The Tektronix emulations allow you to send and receive graphic files from a mainframe or mini. As many of us do not presently have this opportunity, Aegis included a set of graphic files that can be viewed using this emulation. These files are vector based, using points and plotted lines, instead of bit mapped, allowing you to magnify parts of the picture without loss of resolution. Aegis has also included a program, TektoDraw, that converts downloaded Tektronix files to the Aegis Draw format. The inclusion of this feature, and the entire Tektronix emulation capability, speaks to the inherent power of *Diga!* and the Amiga.

Diga!'s other major prowess lies in its script capabilities. Script files, written with your favorite ASCII word processor, allow you to automate your telecommunicating actions from start ("Wait until 4:50 a.m. to call Payola BBS") to finish ("Download everything; log-off"). *Diga!* includes a complete script language consisting of 33 commands. Aside from telecommunication specifics such as "XMSend" (for XModem Send) and "BuffOn" (for turning on your capture buffer), the *Diga!* script language can also handle minor logic branching with its "If-Then-Else" and "Goto" structures.

The script capabilities here are very well thought out and extensive—there really is very little you cannot do via scripts. The included sample script files for logging onto CompuServe and Bix are very instructive. Let's step through the more complex Bix file for an example of scripting finesse. First the script checks to see if you are calling from the phone book and if not sets the baud and dials the number. If we get a "No

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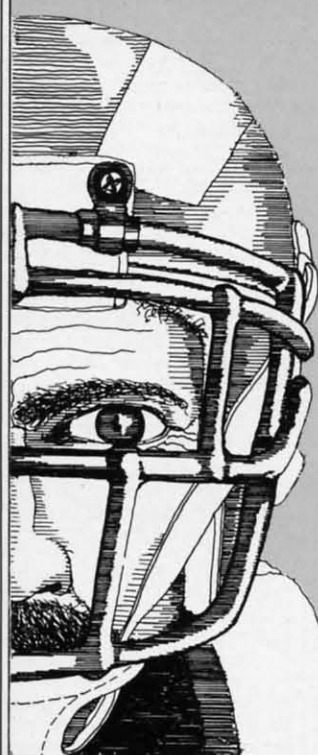


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Carrier" from the modem we abort, but if not we sift through Tymnet's garbage characters and tell them our terminal type followed by the request for Bix, our name, and password. Once in, we turn on the buffer, giving it a specific file name. Next, time to check the mail, if any, so we tell Bix we can handle whatever they can throw at us page-size-wise, and then start a mail downloading loop. When we hit the "Nothing in In-Basket" prompt, we break out of the mail reading loop and go to the main reference reading mode sending the required words until we have captured all the current messages. There are two special conditional branches in this last routine which will send us to the appropriate subroutine when the correct signal is sent from Bix. And with a "DoAt 3:45" command, it can all happen while you snooze.

So far, *Diga!* has performed all the normal telecommunication functions—but as many people said when they heard Aegis had *Diga!* in the works, "Who needs another telecommunication program?" In other words, what

makes *Diga!* truly special? How about a protocol that allows two *Diga!* users to send and receive messages and files simultaneously—I'm talking both doing both at the same time! That's Doubletalk, the new protocol that makes telecommunicating a real joy. It is quite a hoot to be chatting in the separate Doubletalk windows (no more having the line you're furiously typing overwritten by the incoming words) and to watch the File transfer tic off the percentages sent and received. Doubletalk works by "carving up" the modem bandwidth—so that while your file transfer may take up 900 of your 1200 baud, your message is going across at the remaining 300. What saves the transfers from being seemingly longer is a more advanced error checking algorithm. The chat mode definitely seems slowed down, however, even when not in the midst of a file transfer; it would be better if *Diga!* were smarter and could allocate the bandwidth on the fly according to the need or user option. Still it is pretty exciting to be involved in a Doubletalk

transaction—sort of puts the fun back in those long file transfers.

The other groundbreaking area included in *Diga!* is the remote access capability. *Diga!* actually allows you to turn your computer into a mini-BBS without having to dedicate your machine—or your life—to the process. Once *Diga!* is in "Remote" it waits for incoming calls and greets the callers with a "Welcome" file. If they know the proper password (of which there are two levels: one for general entry and one for performing SYSOP-like maintenance) your caller can perform a wide variety of functions: getting a list of options, pulling a directory, listing available volumes, changing directories, reading a file online, changing the host's file transfer protocol, and downloading and uploading files. With SY-SOP status you can also copy files from one volume to another or delete files, remotely. The Remote feature additionally records the date and time a caller logs on and notes any unusual occurrences such as an incorrect password.

Continued on page 113

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REVIEWS

BASIC 8.0

Patech Software/Computer Mart

Commodore 128

Disk; \$39.95

It has been observed by many that nothing is as constant as change. This is certainly true with regard to personal computers and the programs which let us use them. In particular the BASIC language packaged with every Commodore computer has shown significant advances that parallel the introduction of the new machines.

Barely two years have gone by since we first saw the C-128. At its introduction the C-128 offered more power per buck than any other 8 bit computer. Its hardware includes the revered VIC-II and SID chips which have brought fame, fortune, and fantastic software to the C-64. For programmers there is 128K of RAM to play with, a second microprocessor for use with the CP/M operating system, and a wonderfully enhanced BASIC which lets us program graphics and sound without the need for the endless PEEKs and POKEs associated with the C-64. There is even an 80 column, 16 color display with 640 by 200 pixel resolution...and we were told that we couldn't do graphics on it!

Needless to say we were nonplussed. There we were, sitting in front of a Commodore computer with more features and a better BASIC than ever before, and it restricted us to text on the 80 column screen. Subsequent investigations indicated that the situation was not all that bleak. In fact the 8563, the 80 column video display chip, does support bit mapped graphics. Furthermore, although the 8563 lacks the hardware sprites of the VIC-II chip, it does include several bit mapped color modes along with hardware block transfers of bit map data. On top of it all the 8563 has its own 16 kilobytes of video RAM which is in addition to and completely independent from the 128 kilobytes available to the rest of the system.

The problem is that getting at the 8563's high resolution resources is not easy. The entire 8563 chip and its dedicated RAM shows up at only two spots

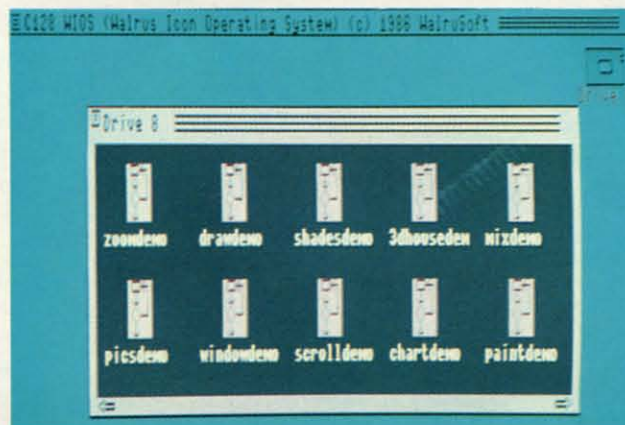
in the C-128's memory map (\$D600 and \$D601). These two addresses act as a window into the world of the 8563 through which all instructions and data must pass. BASIC 7.0, that wonderfully expanded version of PET BASIC, in no way acknowledges the existence of the 8563's resources beyond the display of text. The traditional methods of PEEKing and POKEing the graphics screen do not work in this case. If you want to do 80 column graphics you have to resort to machine language.

This is where BASIC 8.0 comes into the picture. BASIC 8.0 adds extensive 80 column graphics capabilities to the C-128 for BASIC programmers. It is a disk-based system, which means that the BASIC 8.0 programming code has to be loaded from disk each time the C-128 is turned on. You do have the option of buying a ROM chip (\$19.95) which contains the BASIC 8.0 algorithms. This chip is installed in the em-

pty ROM socket found inside every C-128. Once installed, simply holding down the CONTROL key on power up or during a reset will automatically download the BASIC 8.0 system into working RAM. Note that the BASIC 8.0 ROM version is identical to the disk version, as it does not run directly from the optional ROM.

The BASIC 8.0 package contains a 190 page manual, a non-copy protected system disk, and a demonstration disk. The system disk is used to create a BASIC 8.0 editor disk, a BASIC Paint disk, and a BASIC 8.0 Run Time disk. Once these three disks have been created the original distribution disk becomes superfluous, as none of the working disks are copy protected.

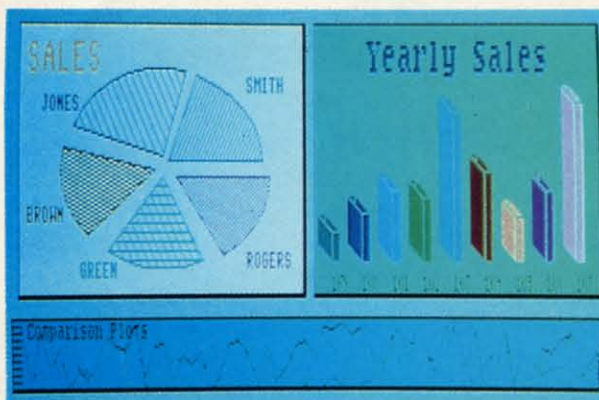
The editor disk is what you boot from when programming in BASIC 8.0. This loads the BASIC 8.0 interpreter routines into RAM. Subsequent use of the disk drive is for the loading and



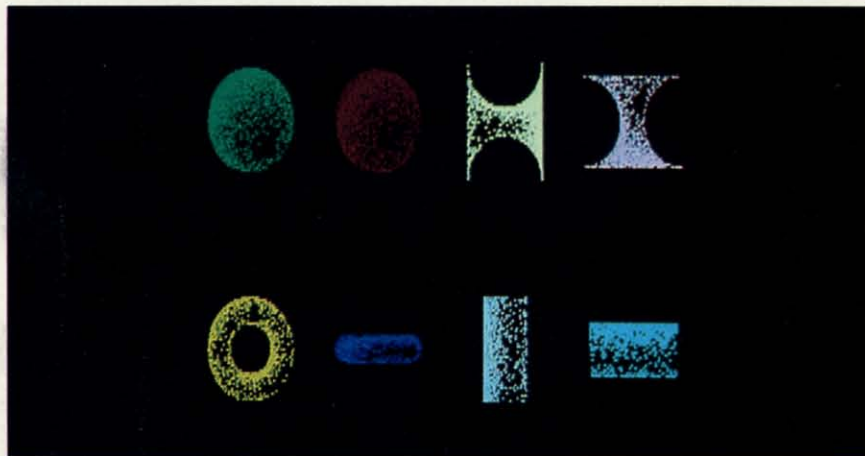
Top: a sample 640 x 200 pixel graphics screen. Bottom: the WIOS Workbench has the look and feel of a real desktop metaphor, but only loads and runs programs.

READER SERVICE NO. 226

PHOTOS BY MORTON KEVELSON



Top: sample 640 x 200 pixel graphics screen. Bottom: some of BASIC 8.0's Rylander solids. Clockwise from top left: sphere, spool, toroid (from top & side) and cylinder.



saving of program and data files as usual. Under the BASIC 8.0 system the C-128 boots with 100,861 bytes free, of which 36,605 bytes are available for program storage.

All of BASIC 8.0's commands start with the commercial at (@) symbol. The BASIC 8.0 interpreter is wedged into BASIC 7.0's syntax error routine where the @ is intercepted and the command is processed. If the @ is not present, the command is processed in the usual fashion. All of BASIC 7.0's commands are still available with the exception of the graphics commands. The 40 column graphics commands utilize memory which has been taken over by BASIC 8.0. Using the 40 column graphics commands in conjunction with BASIC 8.0 will crash the machine.

The 40 column screen may still be used for text output. In fact it is a good idea to use the 40 column display as the default text output device, as BASIC 8.0 ties up the 80 column display when it is doing graphics. This brings us to one of BASIC 8.0's more annoying quirks. The designers made the assumption that a BASIC 8.0 syntax er-

ror would most likely occur during the display of high resolution graphics. To aid in debugging BASIC 8.0 programs, the screen is automatically cleared when a syntax error occurs, even if the program is in text mode. This holds true for the 40 column display which cannot even display bit map graphics while BASIC 8.0 is running. The result is that all screen data is lost after a syntax error while experimenting in immediate mode. This negates much of the advantage of BASIC and the Commodore screen editor as a learning tool for BASIC programmers.

The editor disk also contains a selection of 11 screen fonts, seven printer drivers including a color driver for the Canon PJ1080A, several utility programs, and the WIOS (Walrus Icon Operating System) Workbench program. WIOS provides a graphics user interface as a desktop metaphor for easily loading and running BASIC 8.0 programs. WIOS, which is written in BASIC 8.0, is not meant to serve as a full-featured user interface. It was included as a demonstration of what can be done with BASIC 8.0 and to serve as a sample program for the edifica-

tion of the user.

The Run Time disk provides the means for distributing programs written in BASIC 8.0. It is an autobooting disk which includes the BASIC 8.0 run time code, BASIC 8.0's printer drivers, the WIOS Workbench, and your own programs written in BASIC 8.0. The default setup automatically runs WIOS which displays all of the programs whose file names start with B8. The setup may be easily modified to autoboot any BASIC 8.0 program. The run time module does not provide for the listing or editing of 8.0 programs.

BASIC Paint is a full-featured bit map drawing program for the C-128's 80 column graphic screen. In addition to the mandatory freehand drawing mode, BASIC Paint provides for lines, boxes, circles, polygons, and solid and pattern fills. BASIC Paint will automatically draw three-dimensional solid shapes such as spheres, cylinders, and toroids. There is a cut and paste function and a zoom mode for precise editing. Input to BASIC Paint is via the Joystick or the 1351 mouse.

The most fascinating part of BASIC Paint is that it is also written in BASIC 8.0. BASIC Paint may be listed and modified just like any other BASIC 8.0 program. In effect BASIC Paint is a tour de force of BASIC 8.0 itself. Lack of space prevents us from providing full details on BASIC Paint. However, we will note that BASIC Paint is comparable to stand alone drawing programs which sell for the price of the entire BASIC 8.0 package.

The BASIC 8.0 Demo disk must be considered an integral part of the BASIC 8.0 package. The BASIC 8.0 programs which make up this disk and which demonstrate the speed and power of its graphics also serve to illustrate how the BASIC 8.0 commands are applied. Prospective programmers should not neglect this source of information when learning BASIC 8.0.

The BASIC 8.0 manual is a wealth of information, as it very well should be. Each of the major BASIC 8.0 topics has a dedicated chapter. In addition, there is an alphabetized guide to all the BASIC 8.0 keywords. While the overall organization of the manual was good, the authors did occasionally change thoughts in midstream. This re-

sulted in some important items being unexpectedly presented in the midst of a related subject. As a result the lack of an index became all too apparent. We found that the information we were looking for was generally available; we just had to hunt a bit to find it. The publisher has indicated that a new and presumably improved manual is already in the works.

A Summary of BASIC 8.0 Commands

Here is a brief overview of the BASIC 8.0 commands. As we mentioned above, all of BASIC 8.0's commands start with the @ symbol. Most of BASIC 8.0's commands accept one or more parameters. Unlike other Commodore BASICs, parameters are separated from their associated keyword by a mandatory comma.

SETUP

@WALRUS—BASIC 8.0 was created by David P. DaRUS and Louis R. WALLace. This command sets up the 16K or 64K video RAM systems and must be the first command of any BASIC 8.0 program.

@CLEAR—Clears the screen and sets the bit map colors.

@COLOR—Sets the bit map colors.

80 Column Graphics Memory

The C-128 is equipped with an 8563 video display chip. In bit map mode this chip can generate a display which is 640 pixels wide by 200 pixels high with 16 colors (8 colors in 2 brightness levels). The chip can operate in both interlaced and non-interlaced modes, although this does not increase the vertical resolution. In the original C-128 the 8563 has access to a 16 kilobyte block of dedicated RAM. The latest versions of the C-128 as well as the C-128D may be equipped with 64 kilobytes of RAM which is dedicated to the 8563. This memory is normally used to store the data for both Commodore character sets which are used by the 80 column display. The text screen and its associated color and attribute data are also stored in this memory.

The 8563's video RAM can only be accessed by the video display chip. It cannot be directly accessed by the microprocessor. The video RAM is completely independent from the 128K used by the C-128. As a result none of the 80 column display operations utilize any of the system's RAM.

The 640 by 200 pixel bit map consists of 128,000 pixels. The 16K of video RAM contains 131,072 bits. This does not leave enough room for a full bit map display with color. The 640 by 200 pixel bit map with 16K RAM must be in monochrome.

The 8563 supports variable sized bit maps. This permits a tradeoff between the number of pixels displayed and the use of color. The 8563 also has an adjustable color cell whose width is always 8 pixels but whose height may be varied from 2 to 16 pixels. This permits some additional tradeoffs with re-

gard to bit map size versus color flexibility. Note that the 8563's bit map display is similar to the VIC-II's high resolution display in that only two colors are allowed in a color cell, but the colors of all cells may be independently specified.

The 8563 is capable of addressing up to 64 kilobytes of dedicated video RAM. The video RAM chips supplied with the original C-128s consisted of two 4416s. A 4416 is a 64 kilobit chip (that is 65,536 bits, not bytes) organized as an array which is 4 bits wide and 16,384 addresses long. These chips may be replaced by a pair of 4464s. A 4464 is a quarter megabit chip (262,144 bits, not bytes) organized as an array which is 4 bits wide and 65,536 addresses long. A pair of these chips will upgrade the video RAM to 64 kilobytes, which is enough to store eight full bit maps with varying amounts of color data. As with the original video RAM this memory is in addition to and independent from the C-128's 128K of program RAM. BASIC 8.0 supports both the 16K and 64K RAM configurations. The C-128 operating system will only recognize 16K of video RAM, but it will work just fine with the 4464 chips. The extra RAM beyond the initial 16K will be ignored.

BASIC 8.0 supports eight screen formats on C-128s equipped with 16K of video RAM. These range from a 640 by 200 pixel monochrome screen to a 640 by 104 pixel screen in 16 colors with an 8 by 2 pixel color cell. Intermediate bit map sizes are obtained with 8 by 16, 8 by 8, and 8 by 4 pixel color cells. Some screens may be displayed in interlaced mode.

On a C-128 which is equipped

with 64K of video RAM, BASIC 8.0 supports a full 640 by 200 pixel bit map in 16 colors with any size color cell. Multiple screens may be stored in 64K video RAM. Screens in video RAM may be rapidly swapped using the 8563's hardware block move capabilities. Thus 64K of video RAM will greatly expand the capabilities of BASIC 8.0.

Although only two chips need to be replaced to upgrade the C-128 to 64K of video RAM, it is not a simple job. The existing chips are soldered into place in a crowded portion of the C-128's printed circuit board. We recommend this task only to experienced users with the appropriate skills.

Readers of the *Commodore 128 Programmer's Reference Guide* may have noticed that the 8563 supports 64K of video RAM using 4164 chips. The 4164 is a 16 kilobit chip organized as an array which is one bit wide by 65,536 addresses long. Although this chip is mentioned in an official Commodore publication, it should not be used for two reasons. First, the C-128's operating system will not recognize the 1 bit by 64K organization of the 4164. Second, a total of eight of these chips is required to make 64K of RAM. There is only space for two chips on the C-128's circuit board. Installing eight 4164s would require extensive modification to the board. The reason for the inclusion of the 4164 in the official Commodore documentation is that the quarter megabit 4464 was not yet available at the time the 8563 was developed. The 8563 data in the *Commodore 128 Programmer's Reference Guide* is simply copied from MOS Technology's data sheet for the 8563.

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66 **HOY!**

@DRWMODA, @DRWMOB-
Defines global drawing modes for
graphic commands; sets 3-D viewing
mode as parallel or perspective.

@MODE-Selects the combination
of screen types which can be used.

@SCRDEF-Defines a custom
screen format or type.

@SCREEN-Selects the screen to
be used for drawing or viewing. A 16K
video RAM system can only have a
single screen. A 64K video RAM sys-
tem may have eight screens.

@TEXT-Sets up the standard text
screen.

DRAWING COMMANDS

@ANGLE-Rotates the view angle
about all three axes. All six possible
rotational sequences are available.
BASIC 8.0 has built-in 3-D capabilities.

@ARC, @BOX, @DOT, @LINE,
@CIRCLE-These are the standard
drawing commands. All of them accept
parameters which place them in a
three-dimensional space. Rotation,
scaling, and clipping are also sup-
ported as required.

@BRUSHPATRN-Converts a
brush to a pattern.

@SPHERE, @SPOOL, @TOR-
OID, @CYLNDR-A subset of BASIC
8.0 for drawing Rylander solids. Rich-
ard Rylander published some algo-
rithms for drawing geometric solids us-
ing shaded fills in *Micro Magazine*.
These routines have been incorporated
in BASIC 8.0.

@CHAR-Places text data on the bit
map.

@COPY-Moves a rectangular area
of the screen using the 8563's hardware
block transfer.

@FLASH-Flashes a rectangular
area of the screen.

@GROW-Controls the direction of
growth for the thickness parameter of
the drawing commands.

@ORIGIN-Sets the coordinates for
the center of rotation and the perspec-
tive vanishing point.

@PAINT-Fills an area with a pat-
tern or a solid.

@PIXEL-Interrogates the status of
a pixel.

@PTR-Plots a spritelike pointer on
the screen.

@SCALE-Changes proportions of
the plotting units.

@SCLIP-Sets the clipping boun-

daries for the Rylander solids.

@SCROLL-Scrolls the bit map
area.

@STYLE-Sets the plotting pattern
for the Rylander solids.

@VIEW-Sets the viewing angle for
parallel draw mode.

@WINDOWOPEN, @WINDOW-
CLOSE-Defines a subscreen on the
main screen.

MEMORY MANAGEMENT

@BUFFER-BASIC 8.0 supports
the C-128 RAM expansion module. A
maximum of 10 banks of up to 64K
each may be defined as buffers for stor-
age of graphic data.

@STRUCT, @SDAT, @SEND-
BASIC 8.0 provides four data struc-
tures: pattern, logo, font, and brush.
These three keywords define the data
structure.

@CBRUSH-Change a stored brush
by reversing, reflecting, or flipping it.

@DISPLAY-Recalls a stored screen
or brush to the display.

@FETCH-Recalls an @STASHed
area to the display screen.

@FONT-Loads a custom font for
the text screen.

@LOGO-Sets structure for logo
data.

@LSTRUCT-Loads a structure into
memory.

@PATTERN-Sets pattern structure
number.

@STASH-Places a rectangular
screen area into a brush structure.

@STORE-Saves an entire screen to
disk as a brush structure.

@ZOOM-Enlarges an @STASHed
structure to the screen.

MISCELLANEOUS

@HCOPY-Prints the current screen
on a dot matrix printer. BASIC 8.0 re-
serves a section of memory for custom
printer drivers, of which several are
supplied on disk. The manual includes
the source code of the drivers to per-
mit machine language programmers to
write their own.

@MOUSE-Both the 1351 propor-
tional mouse and the joystick are sup-
ported as input devices for BASIC 8.0.

Conclusion

BASIC 8.0 is both a boon and a bar-
gain for C-128 programmers. There is
little more to say.

REVIEWS

Patech Software, Inc., P.O. Box 5208, Somerset, NJ 08873 (phone: 201-545-1571). Marketed by Computer Mart, Dept. S, 2700 NE Andresen Road, Vancouver, WA 98661 (phone: 206-695-1393).
—Morton Kvelson

LABEL MAKER

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Label Maker is Cheatsheet Products' entry in the label printing program market, currently crowded with dozens of commercial and public domain programs that perform similar if not identical functions. Here at *Ahoy!*, we can expect to receive at least one label-printing program per week.

In the interest of our novice readers, I'd like to point out the fact that label printing programs are quite simple to write, and are usually among the first things attempted by BASIC neophytes, especially those who have just purchased a printer.

Usually, the need for a label can be satisfied by an OPEN statement followed by a few PRINT# commands and a CLOSE at the end. Of course, this is too much to expect of a beginner, as it assumes a familiarity with BASIC and device handling. This will also not suffice if more than a couple of labels are needed.

In such a situation you have two options: Write a program to print the labels for you, or buy a program such as *Label Maker*. If you already have the names and addresses or other data stored on a disk as by a database program, it would be much more difficult to write the program, because you

would also have to learn how to interpret the database files. We have printed articles on how to write label-printing programs, so we'll now turn our attention to *Label Maker*.

Though *Label Maker* is by no means user-unfriendly, it lacks the professional feel and look. It reacts like a very good quality public domain software.

Label Maker does offer a large variety of features not implemented in other programs of this type. It also includes some blank labels of various sizes and types for practice purposes.

The documentation is not necessary, as the program prompts you for all the required information. In case you do encounter any problems, you will find a well-written, though a bit simplistic, manual of some 23 pages (professionally typeset, unlike the documentation we have come to expect from other software companies).

When using the program, you are first prompted for the type of label you wish to print. All the choices are presented on a menu, which highlights each choice and displays a small rendition of the item to be printed out. The miniature renditions are complete with computer printer sprocket holes, and are drawn with their respective dimensions printed beneath. As you move the highlighting choice bar down, the rendition is updated to display the current label type. Label types supported are standard, file folder, hand fed envelopes (both large and small), continuous feed envelopes, name badges, disk labels (3 1/2 and 5 1/4"), rotary file cards, audio cassette tapes, and shipping and order labels.

Each screen is drawn using Commo-



Label Maker offers a large variety of features, along with over 500 blank labels in assorted shapes and sizes (see samples on page following).
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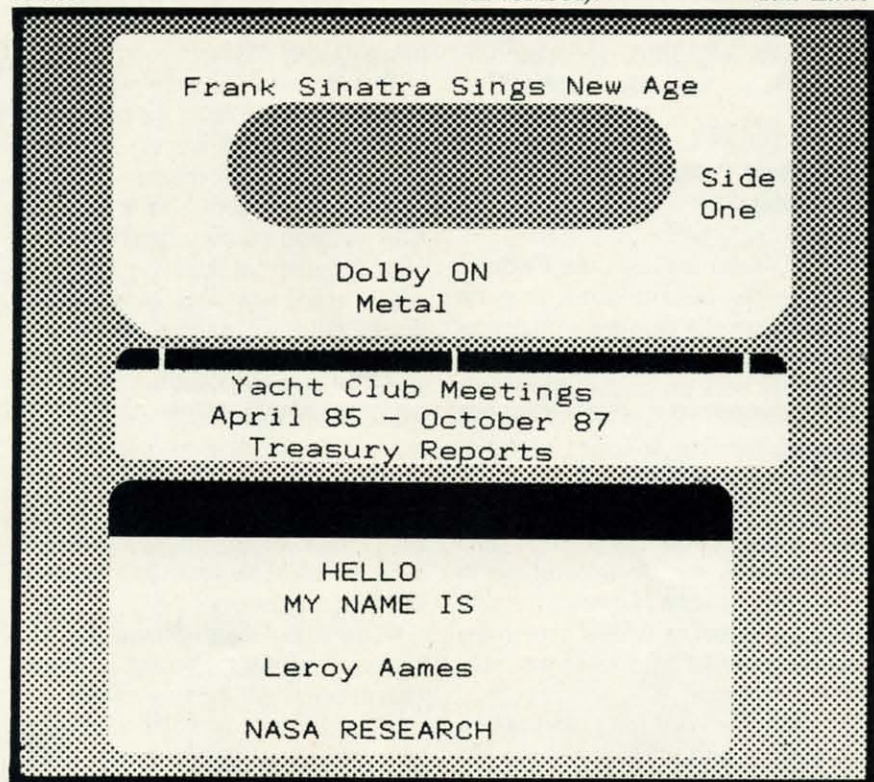
dore graphic text characters, which is rather obvious as you watch the screen drawings and the makeshift windows taking shape. It is also rather obvious that the routine that accepts the messages to be printed on the labels was written in BASIC and compiled, as it intermittently leaves the cursor on the previous line of input. This is no real problem when it comes to printing out the labels, as the program totally ignores the phantom cursors.

As I previously mentioned, the program allows you to use data stored from other databases or word processors for the text on the labels. The book explains the required formats which must be followed should you want to incorporate your previously entered data into the *Label Maker* program.

Even though this program does not sport all the pretty graphic screens, pop-up windows, and other unnecessary bells and whistles of its competition, it does offer real features in their place. This program functions like most public domain software in that it

may not be pretty, but it does get the job done, and it is not a burden to learn to use.

Cheatsheet Products, Inc., P.O. Box 111368, Pittsburgh, PA 15238 (phone: 412-781-1551).
—Tim Little



Sampling of Label Maker-made labels.

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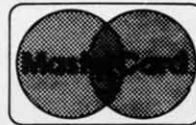
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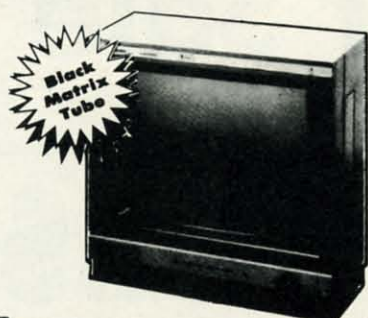


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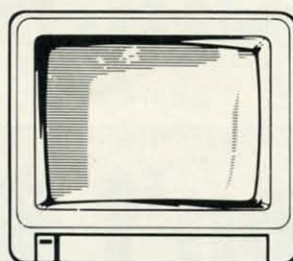
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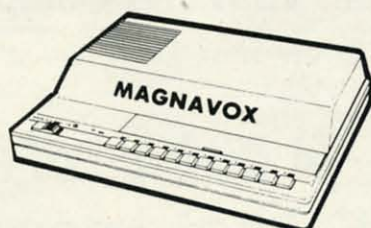
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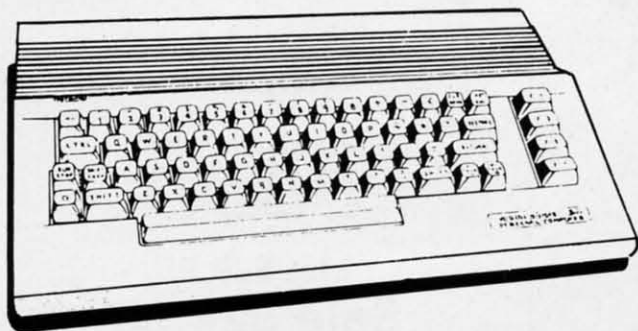
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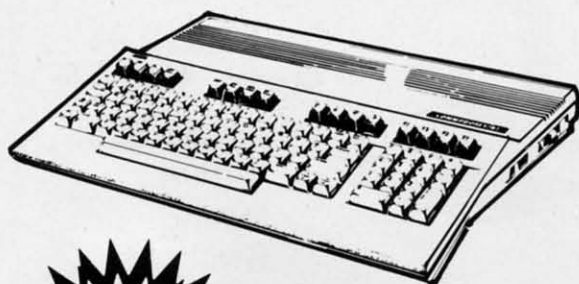
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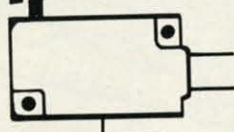
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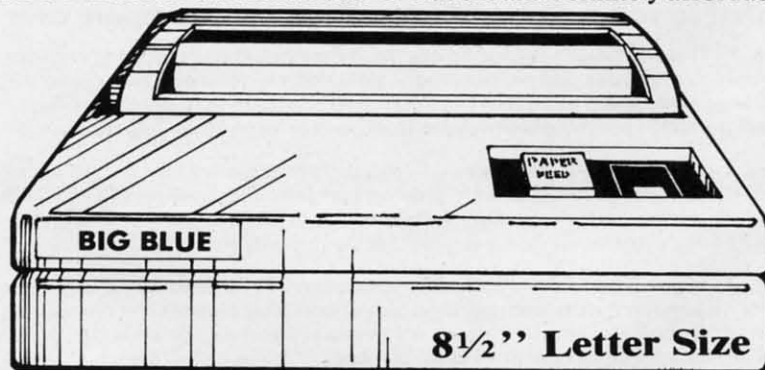
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8K bytes utility buffer

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Text Mode — Bi-directional

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Paper

Plain paper, Roll paper, Single sheet

Fanfold, Multipart paper: max. 3 sheets
(original plus 2 copies)

Character Fonts

Pica, Elite, Italics, Condensed

Printing Method

Impact dot matrix

Printing Speed

160-180 CPS at standard character printing

Printing Characters

Standard 9 x 9 dot matrix

NLQ 12 x 18 dot matrix (33cps)

Character size: 2.12 x 2.8 mm (standard)

Character sets: Full ASCII character set (96)
32 International characters

Ink Ribbon Cartridge

Ribbon Life: 3 million characters/cartridge

Physical Dimensions

Size: 15" x 12" x 5"

Weight: 12.7 lbs.

Maximum Number of Characters

Standard: 10 cpi 80 cpl

Standard enlarged: 5 cpi 40 cpl

Elite: 12 cpi 96 cpl

Elite enlarged: 6 cpi 48 cpl

Condensed: 17 cpi 132 cpl

Condensed enlarged: 8.5 cpi 66 cpl

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Line space lever	0, 1, 1-1/2, and 2
Keyboard selector	I and II
Print pitch	10, 12, and 15

KEYBOARD:

Keys/characters	44/96
Automatic carrier return	
Automatic correction	1 line/240 ch.
Automatic underline	
Relocate key	
Tabulation	
1/2 back space key	

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Keyboard selector	I and II
Print pitch	10, 12, and 15

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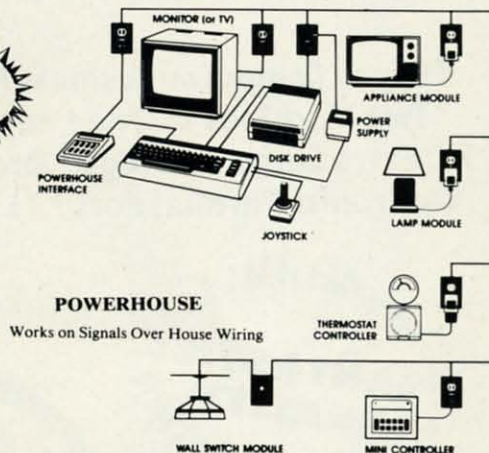
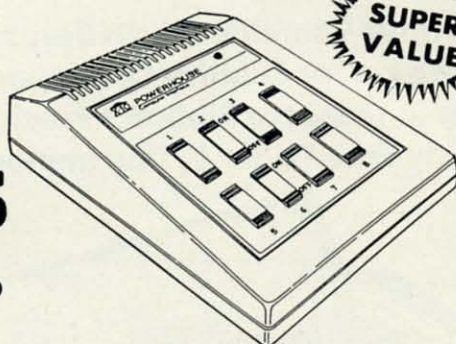
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Includes: Power House Interface plus Computer Software.

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Works on Signals Over House Wiring

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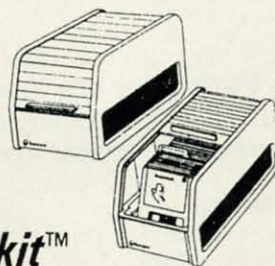


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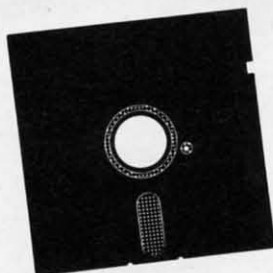
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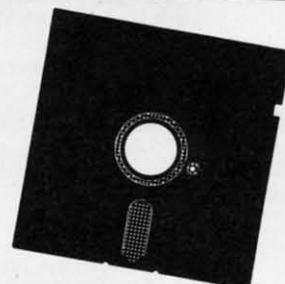
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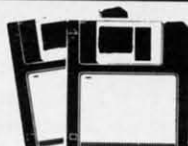
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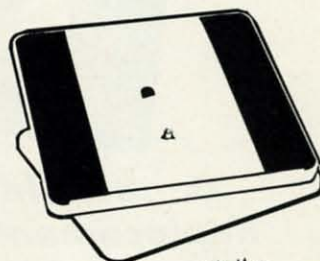
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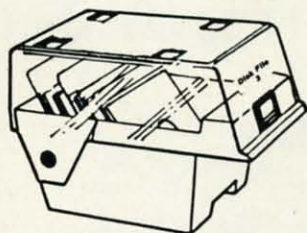


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Protect your disks from harmful dust and dirt particles • No more mishandling • Proper filing will reduce unnecessary wear and tear

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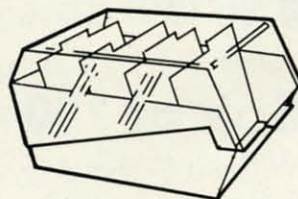
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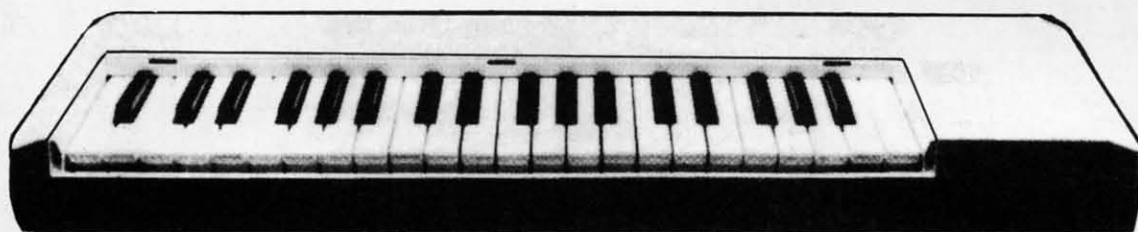
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Features — Sound envelope control with attack, delay, sustain and release times • Records as you play • Playback tracks while you record • Stores songs on disk • Much more

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This Program teaches a beginner how to read music and play it correctly in rhythm on the keyboard. Features trumpet, organ, violin, synthesizer instrument sounds, built-in metronome, pause-play control and set-up menu for customizing the music teacher. (Disk) List \$39.95 **Sale \$24.95**

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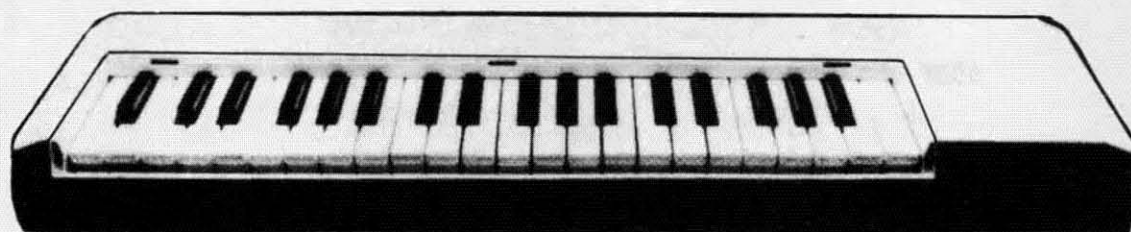
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Ribbon (Life exp.)

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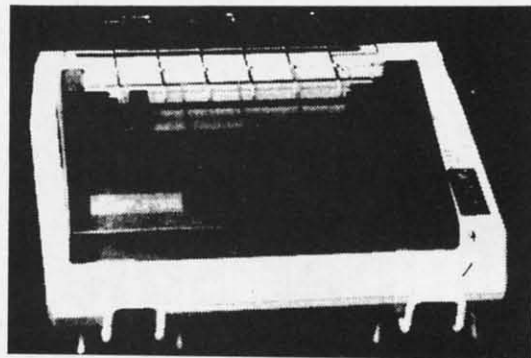
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PROGRAMMING CHALLENGES

By Dale Rupert

Each month, we'll present several challenges designed to stimulate your synapses and toggle the bits in your cerebral random access memory. We invite you to send your solutions to:

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We will print and discuss the cleverest, simplest, shortest, most interesting and/or most unusual solutions. Be sure to identify the *name* and *number* of the problems you are solving. Put *your* name and address on the listings as well. Show sample runs if possible. Briefly describe your solutions and tell what makes them unique or interesting, if they are. You must enclose a stamped, self-addressed envelope if you want any of your materials returned. Solutions received by the middle of the month shown on the magazine cover are most likely to be discussed, but you may send solutions and comments any time. Your original programming problems, suggestions, and ideas are equally welcome. The best ones will become *Commodares*!

PROBLEM #46-1: COLOR BAR

This problem was submitted by Jim Speers (Niles, MI). Write a color selection program which lets the user move a cursor along a color bar to choose screen border, screen, and text colors. All 16 colors should be displayed at once in the color bar. The simpler the better.

PROBLEM #46-2: PHONE CODE

Try this one from Wallace Leeker (Lemay, MO). The telephone keypad is arranged in a matrix like this:

	ABC	DEF
1	2	3
GHI	JKL	MNO
4	5	6
PRS	TUV	WXY
7	8	9

To enter a stock symbol code, each letter is represented by a two-digit number telling the key number and the letter's position (1, 2, or 3) on that key. For the symbol CBM, C becomes 23 since it is the third letter on the number 2 key, B is 22, and M is 61.

Q is given the code 77 and Z is given the code 99, since those letters aren't on the keypad. Write a program that translates any given three-character stock symbol code into its telephone keypad code.

PROBLEM #46-3: LINE LOCATOR

Write a program which gives the location in memory of any specified program line. If the user enters 20 and the "next line" pointer at the beginning of line 20 starts at memory location 2049, for example, the program returns the value 2049. This month's solutions should be of help.

PROBLEM #46-4: CHARACTER BILLIARDS

Write the simplest program possible which allows a graphics character (such as the letter "O") to move around on the screen like a billiard ball, careening off the screen borders in a never-ending motion. No sprites allowed. This should be the essence of animation.

This month we will look at the most interesting and unusual solutions to *Commodares* from the June 1987 issue of *Ahoy!* Problem #42-1: *Internal Deletion* was submitted by Andrew P. Thompson (the "Mad Quoter"). The problem was to write a program which deletes one of its own lines after executing it, and then continues running. The solutions were to provide line 30 in this program to meet those requirements:

```
10 PRINT 10
20 PRINT 20
30 (reader's solution...)
40 LIST
```

There were two fundamental approaches to this problem. Several readers sent both types of solutions. The shortest, but least satisfactory, solution merely changes the program line links so that line 10 points to line 30 rather than to line 20.

BASIC program lines are stored in memory as linked lists. The first two bytes of each program line in memory form the link to the next line. (See this month's *Rupert Report* for a discussion of linked lists.)

The solution for the C-64 looks like this:

```
30 POKE 2049,19
```

and for the C-128:

```
30 POKE 7169,19
```

The problems with this solution are that 1) although it appears that line 20 has been deleted, it really hasn't, and 2) the POKE value works only for this exact example. If lines 10 and 20 are not typed exactly as shown, the program will not work, since line 30 will not be in the right place in memory. If you type RUN again, you will see that line 20

is still executed even if it isn't listed. Its disappearance is an illusion.

If you now edit the program or merely type any line number such as 0 and press RETURN, line 20 is relinked, and it reappears if you list the program.

If you delete the space between the PRINT and the 10 in line 10, then run the program, or if you make any other changes to lines 10 or 20, watch out when you run it! The POKE address no longer corresponds to the start of line 30. One bad link can turn a listing into chaos. You can press RUN STOP, then enter 0 as before. Now LIST should give the original program.

The more general solution to this problem actually deletes line 20 by using dynamic keyboard techniques. The idea is to have the program stuff keystrokes into the keyboard buffer so the computer thinks that you have entered the commands which delete line 20 directly.

Several solutions that used the dynamic keyboard method stuffed cursor movement commands into the keyboard buffer. An even better approach is shown by this program from Tim Gaastra (Redlands, CA):

```

1 REM =====
2 REM   COMMODARES PROBLEM #42-1 :
3 REM   INTERNAL DELETION
4 REM   SOLUTION BY
5 REM   TIM GAASTRA
6 REM ===== C-64 VERSION =====
7 REM - FOR C-128, REPLACE 631, 638, 198
8 REM   IN LINE 30 WITH 842, 849, 208
9 REM
10 PRINT 10
20 PRINT 20
30 FOR A=631 TO 638:READ B:POKE A,B:NEXT
  :POKE 198,8
35 DATA 50,48,13,82,117,52,48,13:STOP
40 LIST

```

The eight characters put into the keyboard buffer are interpreted as:

```

50  48  13  82  117  52  48  13
    2   0  CR   R sh-U   4   0  CR

```

The number 20 is printed followed by a carriage return (CR). Then the abbreviation for RUN 40 (R shift-U 40) is printed, followed by another carriage return. This is done just as if you had entered these characters at the keyboard.

The keyboard buffer begins at address 631 for the C-64 and at address 842 for the C-128. The computer looks to address 198 for the C-64 (208 for the C-128) to find out how many keystrokes are waiting in the buffer. This is why 8 is POKEd into that location.

A STOP or END statement is necessary at the end of line 35 so that the computer goes out and reads the keyboard buffer. Otherwise the computer would finish with line 40 before reading the keyboard. Then there would be a "before" and "after" listing.

Michael Cole (Cambridge, MA) presented an interesting

twist. Instead of putting RUN or GOTO into the keyboard buffer, he used the dynamic keyboard to execute POKE 62,8 : CONT after deleting line 20. Normally BASIC won't let a program continue after it has been edited. Michael did some PEEKing around until he found that POKE 62,8 fools the C-64 into thinking that no line has been edited.

One final variation on this problem is this solution from Claude Landusky (Waianae, HI).

```

1 REM =====
2 REM   COMMODARES PROBLEM #42-1 :
3 REM   INTERNAL DELETION
4 REM   SOLUTION BY
5 REM   CLAUDE LANDUSKY
6 REM =====
10 PRINT 10
20 PRINT 20
30 A=2049:REM <<< USE A=7169 FOR C-128
31 IF PEEK(A+2)<>10 OR PEEK(A+3)<>0 THEN
  A=PEEK(A)+256*PEEK(A+1):GOTO 31
32 B=A
33 IF PEEK(B+2)=40 AND PEEK(B+3)=0 THEN
  GOTO 35
34 B=PEEK(B)+256*PEEK(B+1):C(X)=B:X=
  X+1:GOTO 33
35 POKEA,PEEK(C(X-2)):POKEA+1,PEEK(C(X-2)
  +1):FOR Y=0 TO X-2:POKE C(Y)+4,143:NEXT
40 LIST

```

Be sure to save this program before you run it. Change the value in line 30 if you are using a C-128. Line 31 looks through memory for the location of line number 10. If A is the starting address of the BASIC program, then the first line number is in addresses A+2 (least significant byte) and A+3 (most significant byte).

Here is a summary of how each BASIC program line is stored in memory:

Address	A	A+1	A+2	A+3	A+4...	A+n
Contents	P0	P1	L0	L1	(program text)	0

P0 and P1 form a pointer to the address of the next line in memory. The pointer value is $P0 + 256*P1$. L0 and L1 are the line number of the current line. Its value is $L0 + 256*L1$. Next are the bytes of the program line, followed by one byte of 0. In this example, the value of $P0 + 256*P1$ (the address of the next program line) would be $A+n+1$.

Back to Claude's solution. If the current line number is not 10, line 31 uses the pointer in locations A and A+1 to find the start of the next line. The THEN statement in line 31 calculates the address corresponding to this pointer. The next program line is found and its line number is checked.

Once line 10 has been located, line 33 begins the search for line number 40. The array C(X) stores the starting addresses of each of the lines between 10 and 40. The first two POKE statements in line 35 put the starting address of line 40 into the pointer field of line 10, thereby bypassing lines between 10 and 40 (as far as the LIST command

is concerned). This is comparable to the first solution we discussed earlier.

The FOR-NEXT loop in line 35 replaces the first code byte in each program line with character 143, the token for the REMark statement. Since C(Y) is the starting address of a program line, C(Y)+4 is the address of the first byte in the program line. If you run this program, it shows that lines between 10 and 40 are not listed. As we discussed earlier, however, they are still in memory.

If you press 0, then RETURN, the links to lines 20 through 35 are rewritten. Now the list of the program shows the REM statements at the start of the program lines. The REM effectively "deletes" each line from execution. There is quite a lesson in internal BASIC program structure as well as linked lists and pointers to be learned by studying Claude's solution.

Problem #42-2: Cliff Hanger was suggested by Scott McClare (Espanola, ONT). A person is standing at the midpoint of a log 20 units long suspended at its ends from two cliffs. He randomly shuffles left or right. He reaches safety if he ends up 10 units away from his starting position in 25 shuffles or less. After 25 shuffles, he falls off from exhaustion if he hasn't reached safety.

This program from Craig Ewert (Crystal Lake, IL) gives a nice, animated presentation.

```

1 REM =====
2 REM   COMMODARES PROBLEM #42-2 :
3 REM   CLIFF HANGER
4 REM   SOLUTION BY
5 REM   CRAIG EWERT
6 REM =====
70 DIM RS$(20):FOR I=1 TO 19:RS$(I)="FELL O
  FF AT POSITION"+STR$(I):NEXT
80 RS$(0)="SAFE ON LEFT":RS$(20)="SAFE O
  N RIGHT"
90 SF$(0)="SHUFFLE LEFT":SF$(1)="SHUFFLE
  RIGHT"
100 T=T+1:X=10:FOR I=1 TO 25:Y=RND(1):X=X+1:
  IF Y<.5 THEN X=X-2
110 Z=INT(Y*2):IF X=0 OR X=20 THEN I=25:S
  =S+1
120 PRINT"[CLEAR]S[19"."]S"
130 PRINT"[HOME]"SPC(X)*":PRINT SF$(Z)
140 NEXT:PRINT RS$(X)
150 PRINT S "SUCSESSES OUT OF" T "TRIES"
160 GET K$ : IF K$="" THEN 40
170 GET K$ : IF K$="" THEN 110
180 GOTO 40

```

I have modified Craig's program to keep track of the number of trials and successes, as well as to let the program run repeatedly. If you press any key during a trial, the action will stop at the end of that trial and display the statistics. Press any key to let the program continue.

Bret Ekstrand (Signal Hill, CA) sent an analysis of this classic random walk problem. The probability that he makes it to the right end of the log can be calculated with this equation:

$$W_N(NR) = \frac{N!}{NR! NL!} (0.5)^{NR} (0.5)^{NL}$$

where $W_N(NR)$ is the probability that NR steps out of the total of N steps are to the right. NL is the number of steps taken to the left. N! means "N factorial" where, for example, 5! is $5 * 4 * 3 * 2 * 1$ or 120. The 0.5's are the probabilities of each direction being chosen.

For success in this problem, the total number of steps N must be an even number from 10 to 24. Bret calculated W for N=10, 12, ..., 24 with corresponding values of NR=10, 11, ..., 17 and NL=0, 1, ..., 7. Adding up these eight values of W gives 0.0829 as the probability for success on the right side only. Doubling this gives the probability for reaching safety on either side of the log, which is 0.1658 or roughly 1/6.

Therefore he should make it to safety on the average of one out of every six trials based upon these calculations. You may enjoy running some lengthy trials to see if the simulation agrees with the theory. Remember that the BASIC random number generator is not the most random of generators. My trials gave a success rate roughly half of this calculated value. (Can you statisticians provide any explanations?)

Thanks to all the other readers who sent well-written and nicely animated solutions to this problem. The animations included characters who changed color from fatigue as well as poor souls who fell to their demise before your very eyes.



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3

Chris Knack (Pointe Claire, PQ) added these sound effects to his program for the C-128:

```
10 FOR QW=9000 TO 2000 STEP -1000
20 SOUND 1,QW,5 : NEXT
30 SOUND 1,50874,110,1,21163,1557,1
```

You will readily know which sound signals victory and which one signifies the tumble.

This animated version for the C-64 from Jim "The Glitch" Wilson (Buena Park, CA) uses a sprite.

```
•1 REM =====
•2 REM   COMMODARES PROBLEM #42-2
•3 REM   CLIFF HANGER
•4 REM   SOLUTION BY
•5 REM   JIM WILSON
•6 REM   ===== C-64 ONLY =====
•10 POKE2040,192:POKE53269,1:FORX=12288TO
    12350:POKE53269,X:NEXT
•20 FORX=12289 TO 12311 STEP 3:READY:POKE
    X,Y:NEXT:DATA24,24,18,124,88,20,100,0
•30 PRINT"[CLEAR][10"[DOWN]]"[c 5][RVSON]
    [14" "][c 4][12"[c +]]"[c 5][14" "];
•40 FOR T=1TO13:PRINT"[RVSON][15" "][10"[R
    IGH T]]"[15" "];:NEXT
•50 PRINT"[RVSON][15" "][10"[RIGHT]]"[14"
```

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```
"][HOME][RVSOFF]";:POKE2023,160:POKE562
95,12
•60 PRINT"[WHITE][c A][13"[s C]]"[c S]" +C
    HR$(13)+"[s B][13" "][s B]"
•70 PRINT"[c Z][13"[s C]]"[c X]":X1=172:Y
    1=123
•80 PRINT"[HOME][WHITE]";TAB(16)"[c A][7"
    [s C]]"[c S][DOWN][9"[LEFT]]"[s B][7" "
    [s B][DOWN][9"[LEFT]]"[c Z][7"[s C]]"[c
    X]"
•90 POKE53248,X1:POKE53249,Y1
•100 IFINT(RND(1)*2)=1THENX1=X1+4:PRINT"[
    HOME][DOWN][RIGHT][CYAN]SHUFFLE RIGHT":M
    =M+1:GOTO120
•110 X1=X1-4:M=M+1:PRINT"[HOME][DOWN][RIG
    HT][CYAN]SHUFFLE LEFT "
•120 POKE53248,X1
•130 PRINT"[HOME][DOWN][CYAN]"TAB(17)"MOV
    E";M
•140 IFX1<136THENPRINT"[HOME][DOWN][RIGHT
    ][CYAN]SAFE AT LEFT ":GOTO 180
•150 IFX1>208THENPRINT"[HOME][DOWN][RIGHT
    ][CYAN]SAFE AT RIGHT":GOTO 180
•160 IFM=25THENFORX=123TO255:POKE53249,X:
    NEXT:GOTO 180
•170 FOR T=1 TO 150:NEXT:GOTO 100
•180 GET K$ : IF K$="" THEN 180
•190 RUN
```

Press any key after each trial to restart the program.

Quite a few readers tried their hand at *Problem #42-3: Wildcard Word* suggested by Norm Green (Perth, ONT). The problem was to search through a DATA list of words and find all which matched a wildcard search word. The wildcard search word has asterisks in place of some of its letters. Each asterisk represents one missing letter.

This program from Jim Speers (Niles, MI) is a well-written solution to the problem.

```
•1 REM =====
•2 REM   COMMODARES PROBLEM #42-3 :
•3 REM   WILDCARD WORD
•4 REM   SOLUTION BY
•5 REM   JIM SPEERS
•6 REM   =====
•100 NW=10 : DATA LIST,LOOK,LOST,LAZY,LUC
    K,LUCY,PAST,POST,LICK,BOON
•110 FOR I=1 TO NW : READ L$(I) : NEXT
•120 INPUT"ENTER WORD";W$
•130 PRINT W$: K=0 : FOR I=1 TO NW : E=0
•140 REM IF LEN(L$(I))<>LEN(W$) THEN 180
•150 FOR J=1 TO LEN(W$):X$=MID$(W$,J,1):I
    F X$="*" THEN 170
•160 IF X$<>MID$(L$(I),J,1) THEN E=1
•170 NEXT J:IF E=0 THEN PRINT L$(I):K=1
•180 NEXT I:IF K=0 THEN PRINT"NO MATCH FO
    UND"
•190 PRINT"[DOWN]ANOTHER WORD? (Y/N)"
```


Ahoy!

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A1087

- 200 GET Z\$: IF Z\$="" OR (Z\$<>"Y" AND Z\$<>"N") THEN 200
- 210 IF Z\$="Y" THEN 120

If you change the length of the word list, you must change NW to match the number of words. If your word list contains more than 10 words, you must add a dimension statement such as

```
105 DIM L$(NW)
```

Jim uses two flags, E and K, in his program. If any mismatch exists between the search word and the selected list word, then the E flag is set to 1, and that list word is not printed. Once a match word is found, the K flag is set to 1. This prevents the printing of the "No Match" message.

Jim provides an option within this program. As written, the leftmost letters of each list word are checked up to the length of the search word. If they match that far, the list word is printed. Thus the search word "B*" would match "Be", "Book", and "Bubblegum". If you remove the REM from line 140, only list words the same length as the search word are tested. This is the way the original problem was stated, although DOS allows an asterisk at the end of a word to replace any number of letters.

Problem #42-4: Double Subber was submitted by Danny Faught (Sherman, TX). The idea is to use two key words to encode or decode an input word. Assume the key words are AHOY and ION, and the input word is COMMODORES. Form an alphanumeric addition problem like this:

```
COMMODORES
AHOYAHOYAH
IONIONIONI
```

The key words are repeated or truncated under the input word to match its length. Then the three letters in each column are "added", with results greater than "Z" wrapping back to "A". The first letter of the encoded word would be "C" + "A" + "I" (3+1+9) which is "M" (13). The second character is "O" + "H" + "O" which is "L" (15+8+15=38; 38-26=12). COMMODORES becomes MLPUEZYFTJ.

Here is a nice, concise solution from Bob Wilcher (Lynchburg, VA).

```

1 REM =====
2 REM   COMMODORES PROBLEM #42-4 :
3 REM   DOUBLE SUBBER
4 REM   SOLUTION BY
5 REM   BOB WILCHER
6 REM =====
7 INPUT"ENCODE OR DECODE (E,D)";ED$
8 IF ED$<"D" OR ED$>"E" THEN 7
9 INPUT"MESSAGE, CODE1, CODE2";M$,A$,B$
10 PM=PM+1:IF PM>LEN(M$) THEN END
11 PA=PA+1:IF PA>LEN(A$) THEN PA=1
12 PB=PB+1:IF PB>LEN(B$) THEN PB=1
13 M=ASC(MID$(M$,PM,1)):A=ASC(MID$(A$,PA,1)):B=ASC(MID$(B$,PB,1))

```

- 14 C=M+A+B-192:IF ED\$="D" THEN C=M-A+64
- 15 IF C>26 THEN C=C-26 : GOTO 15
- 16 IF C<0 THEN C=C+26 : GOTO 16
- 17 IF M<65 OR M>90 THEN C=M-64
- 18 PRINT CHR\$(C+64); : GOTO 10

PM, PA, and PB keep track of the character position within each word. When the end of either key word is reached, PA or PB is reset to 1 to cycle through that word again. When the end of the input word is reached in line 10, the program is finished.

Line 14 does the encoding or decoding. Lines 15 and 16 take care of the Z to A wraparound. Line 17 adds an interesting touch. It replaces any encoded character outside of the range A through Z with its original value minus 64. The 64 is added back on when the character is printed in line 18. This lets the user enter multiple-word messages and special symbols such as "!" which are displayed unchanged. HAPPY BIRTHDAY!, AHOY,AHOY becomes JQTNA FGJTLBCO!

Jerry Nichols printed the input and key words on the screen, then used the PEEK command to read the screen codes of each letter rather than using the ASC function. The advantage of this method is that the screen codes for A through Z are 1 through 26. No further math is needed. This method works only for the C-64 or the C-128 in 40-column mode. The 80-column mode screen of the C-128 is in a different location and is less easily accessible.

If you want to test your solution of this problem, be sure to encode input "words" A and Z using Z and Z as the two keywords. Some of the programs submitted did not properly handle the wraparound from Z to A. This example should verify your algorithm. The answers to these two problems are A and Z. Z as a keyword is an identity function; it does not change the value of the input word.

That takes care of this month's problems. Keep those solutions and suggestions coming. You have some tough ones to keep you busy until next month. Enjoy them.

The following people not already mentioned this month also sent valid solutions to *Commodares*. □

Leif Bloomquist (Dauphin, MB)
 Leo Brenneman (Erie, PA)
 Matthew Brock (Tucson, AZ)
 Sumir Chadha (New York, NY)
 Louis Ciavarella
 Curt Donofrio (Shelton, CT)
 Tom Finley (Hampton, VA)
 Thomson Fung (San Diego, CA)
 David Hoffner (Brooklyn, NY)
 Istvan Kallos (Lynn, MA)

Larry Louks (Freeport, TX)
 Chris Martin (Stockton, CA)
 Jeff McCreary
 Lon Olson (Mesa, AZ)
 Louis Schliselfeld
 (Cheektowaga, NY)
 J.H. Smalley (Boulder, CO)
 Robert Wempe (Redlands, CA)
 Gary White (Barksdale AFB, LA)
 Russell Wilson (Fayette, AL)

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PROGRAM LISTINGS

Attention new Ahoy! readers! You must read the following information very carefully prior to typing in programs listed in Ahoy! Certain Commodore characters, commands, and strings of characters and commands will appear in a special format. Follow the instructions and listings guide on this page.



In the following pages you'll find several programs that you can enter on your Commodore computer. But before doing so, read this entire page carefully.

To insure clear reproductions, Ahoy!'s program listings are generated on a daisy wheel printer, incapable of printing the commands and graphic characters used in Commodore programs. These are therefore represented by various codes enclosed in brackets []. For example: the SHIFT CLR/HOME command is represented onscreen by a heart

☛. The code we use in our listings is [CLEAR]. The chart below lists all such codes which you'll encounter in our listings, except for one other special case.

The other special case is the COMMODORE and SHIFT characters. On the front of most keys are two symbols. The symbol on the left is obtained by pressing that key while holding down the COMMODORE key; the symbol on the right, by pressing that key while holding down the SHIFT key. COMMODORE and SHIFT characters are represented in our listings by a lower-case "s" or "c" followed by the symbol of the key you must hit. COMMODORE J, for example, is represented by [c J], and SHIFT J by [s J].

Additionally, any character that occurs more than two times in a row will be displayed by a coded listing. For example, [3 "[LEFT]"] would be 3 CuRSor left commands in a row, [5 "[s EP]"] would be 5 SHIFTed English Pounds, and so on. Multiple blank spaces will be noted in similar fashion: e.g., 22 spaces as [22 " "].

Sometimes you'll find a program line that's too long for the computer to accept (C-64 lines are a maximum of 80 characters, or 2 screen lines long; C-128 lines, a maximum of 160 characters, 2 or 4 screen lines in 40 or 80 columns respectively). To enter these lines, refer to the *BASIC Command Abbreviations Appendix* in your User Manual.

On the next page you'll find our *Bug Repellent* programs for the C-128 and C-64. The version for your machine will help you proofread programs after typing them. (Please note: the *Bug Repellent* line codes that follow each program line, in the whited-out area, should *not* be typed in. See instructions preceding each program.)

On the second page following you will find *Flankspeed*, our ML entry program, and instructions on its use.

Call Ahoy! at 212-239-6089 with any problems (if busy or no answer after three rings, call 212-239-0855).

WHEN YOU SEE	IT MEANS	YOU TYPE	YOU WILL SEE	WHEN YOU SEE	IT MEANS	YOU TYPE	YOU WILL SEE
[CLEAR]	Screen Clear	SHIFT CLR/HOME	☛	[BLACK]	Black	CNTRL 1	■
[HOME]	Home	CLR/HOME	S	[WHITE]	White	CNTRL 2	□
[UP]	Cursor Up	SHIFT ↑ CRSR ↓	⬆	[RED]	Red	CNTRL 3	■
[DOWN]	Cursor Down	↑ CRSR ↓	⬇	[CYAN]	Cyan	CNTRL 4	■
[LEFT]	Cursor Left	SHIFT ← CRSR →	⬅	[PURPLE]	Purple	CNTRL 5	■
[RIGHT]	Cursor Right	← CRSR →	➡	[GREEN]	Green	CNTRL 6	■
[SS]	Shifted Space	SHIFT Space	■	[BLUE]	Blue	CNTRL 7	■
[INSERT]	Insert	SHIFT INST/DEL	■	[YELLOW]	Yellow	CNTRL 8	■
[DEL]	Delete	INST/DEL	■	[F1]	Function 1	F1	■
[RVSON]	Reverse On	CNTRL 9	R	[F2]	Function 2	SHIFT F1	■
[RVSOFF]	Reverse Off	CNTRL 0	■	[F3]	Function 3	F3	■
[UPARROW]	Up Arrow	↑	⬆	[F4]	Function 4	SHIFT F3	■
[BACKARROW]	Back Arrow	←	⬅	[F5]	Function 5	F5	■
[PI]	PI	π	π	[F6]	Function 6	SHIFT F5	■
[EP]	English Pound	£	£	[F7]	Function 7	F7	■
				[F8]	Function 8	SHIFT F7	■

BUG REPELLENT FOR THE 64 & 128 By BUCK CHILDRESS

Please note: the *Bug Repellent* programs listed here are for *Ahoy!* programs published from the May 1987 issue onward! For older programs, use the older version.

Type in, save, and run *Bug Repellent*. You'll be asked if you want automatic saves to take place. If so, you're prompted for the device, DISK (D) or TAPE (T). You then pick a starting file number, 0 through 99. Next, you enter a name, up to 14 characters long. At this point, *Bug Repellent* verifies your entries and gives you a chance to change them if you want. If no changes are needed, *Bug Repellent* activates itself. (Pressing RETURN without answering the prompts defaults to disk drive and begins your files with "OBACKUP".)

Type NEW and begin entering an *Ahoy!* program. As you enter program lines and press RETURN, a *Bug Repellent* code appears at the top of your screen. If it doesn't match the code in the program listing, an error exists. Correct the line and the codes will match.

If used, automatic saves take place every 15 minutes. When the RETURN key is pressed on a program line, the screen changes color to let you know that a save will begin in about three seconds. You may cancel the save by pressing the RUN STOP key. The file number increments after each save. It resets to 00 if 99 is surpassed. After saving, or cancelling, the screen returns to its original color and the timer resets for 15 minutes.

When you've finished using *Bug Repellent*, deactivate it by typing SYS 49152 [RETURN] for the Commodore 64 or SYS 4864 [RETURN] for the Commodore 128.

C-64 BUG REPELLENT

```

10 PRINTCHR$(147)"LOADING AND CHECKING THE DATA[3].":J
=49152
20 FORB=0TO11:READA:IFA<0ORA>255THEN40
30 POKEJ+B,A:X=X+A:NEXTB:READA:IFA=XTHEN50
40 PRINT:PRINT"ERROR IN DATA LINE:"PEEK(64)*256+PEEK(63)
:END
50 X=0:J=J+12:IFJ<49456THEN20
60 POKE198,0:POKE49456,0:A$="Y":B$=A$:C$="D":D$="DISK":D
=8:PRINTCHR$(147)
70 INPUT"DO YOU WANT AUTOMATIC SAVES (Y/N)";A$:PRINT:IFA
$="Y"THEN90
80 PRINT"NO AUTOMATIC SAVES[3].":GOTO150
90 POKE49456,1:INPUT"DISK OR TAPE (D/T)";C$:IFC$<>"D"THE
ND=1:D$="TAPE"
100 POKE49457,D:D$=D$+" DRIVE":PRINT:INPUT"FILE NUMBER (
0-99)";N
110 N$=RIGHT$(STR$(N),2):IFN<10THENN$=CHR$(48)+CHR$(N+48
)
120 F$="BACKUP":PRINT:INPUT"FILENAME";F$:F$=N$+LEFT$(F$,
14):L=LEN(F$)
130 POKE49458,L:FORJ=1TOL:POKE49458+J,ASC(MID$(F$,J,1)):
NEXTJ:PRINT
140 PRINT"SAVING DEVICE ** "D$:PRINT"STARTING WITH ** "F
$
150 PRINT:INPUT"IS THIS CORRECT (Y/N)";B$:IFB$<>"Y"THEN6
0
160 POKE770,131:POKE771,164:SYS49152:END
170 DATA169,79,32,210,255,162,38,160,192,204,3,3,1507
180 DATA208,10,162,131,160,164,169,70,32,210,255,44,1615
190 DATA169,78,32,210,255,142,2,3,140,3,3,76,1113
200 DATA36,193,32,96,165,134,122,132,123,32,115,0,1180
210 DATA170,240,243,162,255,134,58,144,3,76,150,164,1799
220 DATA32,107,169,32,121,165,173,0,2,240,5,169,1215
230 DATA79,141,2,3,76,162,164,169,0,133,2,133,1064
240 DATA251,133,252,133,254,24,101,20,69,254,230,254,197
5
250 DATA24,101,21,69,254,170,230,254,164,252,185,0,1724
260 DATA2,133,253,201,34,208,6,165,2,73,255,133,1465
270 DATA2,201,32,208,4,165,2,240,8,138,24,101,1125
280 DATA253,69,254,170,44,198,254,230,252,164,253,208,23
49
290 DATA213,138,41,240,74,74,74,74,24,105,129,141,1327
300 DATA44,193,138,41,15,24,105,129,141,45,193,162,1230
310 DATA0,189,43,193,240,12,157,0,4,173,134,2,1147
320 DATA157,0,216,232,208,239,169,38,141,2,3,173,1578
330 DATA48,193,240,23,165,161,201,212,176,4,165,160,1748
340 DATA240,13,238,32,208,160,0,32,225,255,208,6,1617
350 DATA32,33,193,76,38,192,232,208,242,200,208,239,1893
360 DATA32,68,229,169,0,168,174,49,193,32,186,255,1555
370 DATA173,50,193,162,51,160,193,32,189,255,169,43,1670
380 DATA166,45,164,46,32,216,255,162,1,189,51,193,1520
390 DATA168,200,152,201,58,144,2,169,48,157,51,193,1543
400 DATA201,48,208,3,202,16,234,32,33,193,76,116,1362
410 DATA164,206,32,208,169,0,170,168,76,219,255,160,1827
420 DATA1,1,160,0,0,65,72,79,89,33,0,0,500

```

C-128 BUG REPELLENT

```

10 PRINTCHR$(147)"LOADING AND CHECKING THE DATA[3].":J
=4864
20 FORB=0TO11:READA:IFA<0ORA>255THEN40
30 POKEJ+B,A:X=X+A:NEXTB:READA:IFA=XTHEN50
40 PRINT:PRINT"ERROR IN DATA LINE:"PEEK(66)*256+PEEK(65)
:END
50 X=0:J=J+12:IFJ<5213THEN20
60 POKE208,0:POKE5213,0:A$="Y":B$=A$:C$="D":D$="DISK":D=
8:PRINTCHR$(147)
70 INPUT"DO YOU WANT AUTOMATIC SAVES (Y/N)";A$:PRINT:IFA
$="Y"THEN90
80 PRINT"NO AUTOMATIC SAVES[3].":GOTO150
90 POKE5213,1:INPUT"DISK OR TAPE (D/T)";C$:IFC$<>"D"THEN
D=1:D$="TAPE"
100 POKE5214,D:D$=D$+" DRIVE":PRINT:INPUT"FILE NUMBER (0
-99)";N
110 N$=RIGHT$(STR$(N),2):IFN<10THENN$=CHR$(48)+CHR$(N+48
)
120 F$="BACKUP":PRINT:INPUT"FILENAME";F$:F$=N$+LEFT$(F$,
14):L=LEN(F$)
130 POKE5215,L:FORJ=1TOL:POKE5215+J,ASC(MID$(F$,J,1)):NE
XTJ:PRINT
140 PRINT"SAVING DEVICE ** "D$:PRINT"STARTING WITH ** "F
$
150 PRINT:INPUT"IS THIS CORRECT (Y/N)";B$:IFB$<>"Y"THEN6
0
160 POKE770,198:POKE771,77:SYS4864:END
170 DATA32,58,20,169,41,162,19,236,3,3,208,4,955
180 DATA169,198,162,77,141,2,3,142,3,3,224,19,1143
190 DATA208,7,32,125,255,79,78,0,96,32,125,255,1292
200 DATA79,70,70,0,96,162,0,134,251,189,0,2,1053
210 DATA240,19,201,48,144,9,201,58,176,5,133,251,1485
220 DATA232,208,238,134,252,165,251,208,3,76,198,77,2042
230 DATA169,0,166,235,164,236,133,253,133,254,142,47,193
2
240 DATA20,140,48,20,24,101,22,69,254,230,254,24,1206
250 DATA101,23,69,254,170,230,254,164,252,185,0,2,1704
260 DATA133,251,201,34,208,6,165,253,73,255,133,253,1965
270 DATA201,32,208,4,165,253,240,8,138,24,101,251,1625
280 DATA69,254,170,44,198,254,230,252,164,251,208,213,23
07
290 DATA138,41,240,74,74,74,74,24,105,65,141,88,1138
300 DATA20,138,41,15,24,105,65,141,89,20,32,79,769
310 DATA20,189,85,20,240,6,32,210,255,232,208,245,1742
320 DATA174,47,20,172,48,20,24,32,240,255,173,93,1298
330 DATA20,240,27,165,161,201,212,176,4,165,160,240,1771
340 DATA17,32,65,20,238,32,208,238,1,214,32,225,1322
350 DATA255,208,6,32,49,20,76,198,77,232,208,242,1603
360 DATA200,208,239,32,66,193,173,95,20,162,96,160,1644
370 DATA20,32,189,255,169,0,170,32,104,255,169,0,1395
380 DATA174,94,20,168,32,186,255,169,45,174,16,18,1351
390 DATA172,17,18,32,216,255,162,1,189,96,20,168,1346
400 DATA200,152,201,58,144,2,169,48,157,96,20,201,1448
410 DATA48,208,3,202,16,234,32,49,20,141,0,2,955
420 DATA76,183,77,58,59,32,65,20,206,32,208,206,1222
430 DATA1,214,169,0,170,168,76,219,255,32,79,20,1403
440 DATA169,26,141,0,214,173,0,214,16,251,96,162,1462
450 DATA0,142,0,255,96,19,18,32,32,32,32,146,804
460 DATA0,1,0,0,65,72,79,89,33,0,0,0,339

```


FLANKSPEED FOR THE C-64 By GORDON F. WHEAT

Flankspeed will allow you to enter machine language *Ahoy!* programs without any mistakes. Once you have typed the program in, save it for future use. While entering an ML program with *Flankspeed* there is no need to enter spaces or hit the carriage return. This is all done automatically. If you make an error in a line a bell will ring and you will be asked to enter it again. To LOAD in a program Saved with *Flankspeed* use LOAD "name",1,1 for tape, or LOAD "name",8,1 for disk. The function keys may be used after the starting and ending addresses have been entered.

f1—SAVES what you have entered so far.

f3—LOADs in a program worked on previously.

f5—To continue on a line you stopped on after LOADING in the previous saved work.

f7—Scans through the program to locate a particular line, or to find out where you stopped the last time you entered the program. It temporarily freezes the output as well.

•100 POKE53280,12:POKE53281,11	OP	5	IK
•105 PRINT"[CLEAR][c 8][RVSON][15" "]FLANKSPEED[15"]";	FP	•390 PRINT:PRINT"ADDRESS NOT WITHIN SPECIFIED RANGE!":B=0:	HK
•110 PRINT"[RVSON][5" "]MISTAKEPROOF ML ENTRY PROGRAM[6" "		GOTO415	DM
•115 PRINT"[RVSON][9" "]CREATED BY G. F. WHEAT[9" "]	JP	•395 PRINT:PRINT"NOT ZERO PAGE OR ROM!":B=0:GOTO415	JK
•120 PRINT"[RVSON][3" "]COPR. 1987, ION INTERNATIONAL INC.	FA	•400 PRINT"?ERROR IN SAVE":GOTO415	IO
[3" "]		•405 PRINT"?ERROR IN LOAD":GOTO415	JO
•125 FORA=54272TO54296:POKEA,0:NEXT	AJ	•410 PRINT:PRINT:PRINT"END OF ML AREA":PRINT	BF
•130 POKE54272,4:POKE54273,48:POKE54277,0:POKE54278,249:PO	ND	•415 POKE54276,17:POKE54276,16:RETURN	DH
KE54296,15		•420 OPEN15,8,15:INPUT#15,A,A\$:CLOSE15:PRINTA\$:RETURN	IM
•135 FORA=680TO699:READB:POKEA,B:NEXT	NP	•425 REM GET FOUR DIGIT HEX	OL
•140 DATA169,251,166,253,164,254,32,216,255,96	FL	•430 PRINT:PRINTB\$;:INPUTT\$	JD
•145 DATA169,0,166,251,164,252,32,213,255,96	FF	•435 IFLEN(T\$)<>4THENGOSUB380:GOTO430	
•150 B\$="STARTING ADDRESS IN HEX":GOSUB430:AD=B:SR=B	EK	•440 FORA=1TO4:A\$=MID\$(T\$,A,1):GOSUB450:IFT(A)=16THENGOSUB	AK
•155 GOSUB480:IFB=0THEN150	KP	380:GOTO430	KB
•160 POKE251,T(4)+T(3)*16:POKE252,T(2)+T(1)*16	OE	•445 NEXT:B=(T(1)*4096)+(T(2)*256)+(T(3)*16)+T(4):RETURN	GM
•165 B\$="ENDING ADDRESS IN HEX":GOSUB430:EN=B	AM	•450 IFA\$>"@ANDAS<"G"THENT(A)=ASC(A\$)-55:RETURN	NJ
•170 GOSUB470:IFB=0THEN150	PE	•455 IFA\$>"/ANDAS<":THENT(A)=ASC(A\$)-48:RETURN	IC
•175 POKE254,T(2)+T(1)*16:B=T(4)+1+T(3)*16	PG	•460 T(A)=16:RETURN	OL
•180 IFB>255THENB=B-255:POKE254,PEEK(254)+1	GM	•465 REM ADDRESS CHECK	HO
•185 POKE253,B:PRINT	HG	•470 IFAD>ENTHEN385	LE
•190 REM GET HEX LINE	EC	•475 IFB<SRORB>ENTHEN390	OB
•195 GOSUB495:PRINT":[c P][LEFT]";:FORA=0TO8	ED	•480 IFB<256OR(B>40960ANDB<49152)ORB>53247THEN395	HE
•200 FORB=0TO1:GOTO250	KD	•485 RETURN	PM
•205 NEXTB	IH	•490 REM ADDRESS TO HEX	AP
•210 A\$(A)=T(1)+T(0)*16:IFAD+A-1=ENTHEN340	IJ	•495 AC=AD:A=4096:GOSUB520	NF
•215 PRINT"[c P][LEFT]";	FA	•500 A=256:GOSUB520	LG
•220 NEXTA:T=AD-(INT(AD/256)*256):PRINT" "	EG	•505 A=16:GOSUB520	HE
•225 FORA=0TO7:T=T+A\$(A):IFT>255THENT=T-255	II	•510 A=1:GOSUB520	JD
•230 NEXT	GL	•515 RETURN	OC
•235 IFA\$(8)<>TTHENGOSUB375:GOTO195	GI	•520 T=INT(AC/A):IFT>9THENA\$=CHR\$(T+55):GOTO530	JJ
•240 FORA=0TO7:POKEAD+A,A\$(A):NEXT:AD=AD+8:GOTO195	FL	•525 A\$=CHR\$(T+48)	AA
•245 REM GET HEX INPUT	IM	•530 PRINTA\$:AC=AC-A*T:RETURN	IC
•250 GETA\$:IFA\$=""THEN250	PA	•535 A\$="**SAVE**":GOSUB585	AB
•255 IFA\$=CHR\$(20)THEN305	GA	•540 OPEN1,T,1,A\$:SYS680:CLOSE1	FB
•260 IFA\$=CHR\$(133)THEN535	GO	•545 IFST=0THENEND	PM
•265 IFA\$=CHR\$(134)THEN560	LM	•550 GOSUB400:IFT=8THENGOSUB420	FI
•270 IFA\$=CHR\$(135)THENPRINT" ":GOTO620	IG	•555 GOTO535	PE
•275 IFA\$=CHR\$(136)THENPRINT" ":GOTO635	HO	•560 A\$="**LOAD**":GOSUB585	PO
•280 IFA\$>"@ANDAS<"G"THENT(B)=ASC(A\$)-55:GOTO295	HE	•565 OPEN1,T,0,A\$:SYS690:CLOSE1	OI
•285 IFA\$>"/ANDAS<":THENT(B)=ASC(A\$)-48:GOTO295	MI	•570 IFST=64THEN195	CO
•290 GOSUB415:GOTO250	DJ	•575 GOSUB405:IFT=8THENGOSUB420	GN
•295 PRINTA\$[c P][LEFT]";	JA	•580 GOTO560	KA
•300 GOTO205	PK	•585 PRINT" ":PRINTTAB(14)A\$	IO
•305 IFA>0THEN320	FA	•590 PRINT:A\$=""INPUT"FILENAME":A\$	HK
•310 A=-1:IFB=1THEN330	BI	•595 IFA\$=""THEN590	HL
•315 GOTO220	BB	•600 PRINT:PRINT"TAPE OR DISK?":PRINT	NP
•320 IFB=0THENPRINTCHR\$(20);CHR\$(20);:A=A-1	FA	•605 GETB\$:T=1:IFB\$="D"THENT=8:A\$="0":A\$+A\$:RETURN	KO
•325 A=A-1	BF	•610 IFB\$<>"T"THEN605	PH
•330 PRINTCHR\$(20);:GOTO220	FK	•615 RETURN	DD
•335 REM LAST LINE	PH	•620 B\$="CONTINUE FROM ADDRESS":GOSUB430:AD=B	NK
•340 PRINT" ":T=AD-(INT(AD/256)*256)	CP	•625 GOSUB475:IFB=0THEN620	HN
•345 FORB=0TOA-1:T=T+A\$(B):IFT>255THENT=T-255	KH	•630 PRINT:GOTO195	FK
•350 NEXT	OD	•635 B\$="BEGIN SCAN AT ADDRESS":GOSUB430:AD=B	LN
•355 IFA\$(A)<>TTHENGOSUB375:GOTO195	OB	•640 GOSUB475:IFB=0THEN635	HI
•360 FORB=0TOA-1:POKEAD+B,A\$(B):NEXT	LH	•645 PRINT:GOTO670	LM
•365 PRINT:PRINT"YOU ARE FINISHED!":GOTO535	BO	•650 FORB=0TO7:AC=PEEK(AD+B):GOSUB505:IFAD+B=ENTHENAD=SR:G	LE
•370 REM BELL AND ERROR MESSAGES	MB	OSUB410:GOTO195	CD
•375 PRINT:PRINT"LINE ENTERED INCORRECTLY":PRINT:GOTO415	LM	•655 PRINT" ":NEXTB	JD
•380 PRINT:PRINT"INPUT A 4 DIGIT HEX VALUE!":GOTO415	JK	•660 PRINT:AD=AD+8	KE
•385 PRINT:PRINT"ENDING IS LESS THAN STARTING!":B=0:GOTO41	PG	•665 GETB\$:IFB\$=CHR\$(136)THEN195	
		•670 GOSUB495:PRINT" ":GOTO650	

SPRAY-CAM

FROM PAGE 18

Starting address in hex: C000

Ending address in hex: C997

SYS to start: 49152

Flankspeed required for entry! See page 95.

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C000: 20 CA C5 20 80 C4 20 18 4E
C008: C7 20 69 C1 AD 03 D0 C9 66
C010: 66 D0 09 20 18 C1 20 37 A1
C018: C0 4C 1F C0 20 59 C0 20 5F
C020: FE C1 AD 02 D0 C9 3E D0 3A
C028: 0B 20 ED C0 AD 51 C0 F0 B2
C030: 03 4C A5 C0 4C 0C C0 EE ED
C038: 4F C0 AD 4F C0 D0 F8 EE BE
C040: 50 C0 AD 50 C0 C9 0E D0 B8
C048: EE A9 00 8D 50 C0 60 00 DF
C050: 00 00 00 00 00 00 00 00 50
C058: 00 AD 1E C1 8D 55 C0 A9 33
C060: 70 8D 1E C1 AD BF C1 8D FA
C068: 56 C0 AD BE C1 8D 57 C0 53
C070: A9 00 8D 58 C0 8D BF C1 CF
C078: 8D BE C1 20 18 C1 A0 00 21
C080: C8 C0 00 D0 FB EE BF C1 47
C088: EE 58 C0 AD 58 C0 C9 05 26
C090: D0 E9 AD 55 C0 8D 1E C1 7C
C098: AD 56 C0 8D BF C1 AD 57 71
C0A0: C0 8D BE C1 60 A9 70 8D 77
C0A8: 1E C1 A9 00 8D BE C1 A9 E9
C0B0: 09 8D BF C1 A2 00 A9 07 1C
C0B8: 9D C9 D9 9D F1 D9 9D 19 1A
C0C0: DA E8 E0 05 D0 F0 20 E4 31
C0C8: FF F0 03 4C 03 C0 20 18 05
C0D0: C1 A0 00 20 37 C0 C8 C0 D4
C0D8: 05 D0 F8 EE BF C1 AD BF 85
C0E0: C1 C9 14 D0 E1 A9 09 8D 73
C0E8: BF C1 4C C6 C0 A9 00 8D 75
C0F0: 52 C0 A2 00 BD 00 60 C9 8E
C0F8: 9C F0 12 E8 E0 00 D0 F4 28
C100: EE F6 C0 AD F6 C0 C9 70 46
C108: D0 E8 EE 51 C0 A9 60 8D 5A
C110: F6 C0 A9 00 8D F5 C0 60 16
C118: AD BE C1 85 FB A9 60 85 57
C120: FC AE BF C1 E0 00 F0 10 2F
C128: A5 FB 18 69 14 85 FB A5 86
C130: FC 69 00 85 FC CA D0 F0 A5
C138: A9 C9 85 02 A9 05 85 03 6A
C140: A2 02 A0 04 B1 FB 91 02 CA
C148: 88 10 F9 18 A5 02 69 28 2C
C150: 85 02 A5 03 69 00 85 03 72
C158: 18 A5 FB 69 14 85 FB A5 B6
C160: FC 69 00 85 FC CA 10 DA FE
C168: 60 A2 00 BD CB C1 8D 7A BE
C170: C1 BD D4 C1 8D 7B C1 A9 FA
C178: 08 8D B7 DA E8 E0 09 D0 44
C180: EA AE BD C1 BD CB C1 8D 72
C188: 93 C1 BD D4 C1 8D 94 C1 16

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C190: A9 09 8D B7 DA AD F9 07 12
C198: C9 E2 D0 05 A9 0D 8D 2F 8E
C1A0: DB C9 E3 D0 05 A9 0D 8D 44
C1A8: 57 DB C9 E4 D0 05 A9 0D 17
C1B0: 8D 37 DB C9 E5 D0 05 A9 80
C1B8: 0D 8D 5F DB 60 00 00 00 EE
C1C0: 00 00 02 04 06 08 01 03 D8
C1C8: 05 07 08 B7 BF DF E7 2F 4B
C1D0: 37 57 5F AB DA DA DA DA D5
C1D8: DB DB DB DB DB 4E 8E CE CF
C1E0: 0E 60 64 68 6C 02 07 0C 9D
C1E8: 11 4A 52 5A 62 46 4E 56 3E
C1F0: 5E 7F 87 8F 97 02 0C 01 8C
C1F8: 03 0B 0D 05 12 60 AD 00 39
C200: DC C9 7F F0 F8 8D C0 C1 20
C208: C9 7E D0 10 AD BD C1 C9 28
C210: 02 90 09 CE BD C1 CE BD 86
C218: C1 20 69 C1 AD C0 C1 C9 1F
C220: 7D D0 1B AD BD C1 C9 08 88
C228: F0 14 C9 07 D0 07 EE BD 82
C230: C1 20 69 C1 60 EE BD C1 0C
C238: EE BD C1 20 69 C1 AD C0 60
C240: C1 C9 7B D0 15 A2 00 AD 7D
C248: BD C1 DD C1 C1 F0 0B E8 0E
C250: E0 05 D0 F3 CE BD C1 20 69
C258: 69 C1 AD C0 C1 C9 77 D0 C5
C260: 15 A2 00 AD BD C1 DD C6 E9
C268: C1 F0 0B E8 E0 05 D0 F3 B9
C270: EE BD C1 20 69 C1 AD C0 98
C278: C1 C9 6F D0 03 4C 89 C2 DF
C280: 20 37 C0 A9 00 8D C0 C1 52
C288: 60 AD BD C1 C9 04 90 43 B7
C290: AD BD C1 C9 08 D0 03 4C AF
C298: 1F C4 AD BD C1 C9 04 D0 48
C2A0: 04 A2 E2 A0 00 AD BD C1 F7
C2A8: C9 05 D0 04 A2 E4 A0 0A 7E
C2B0: AD BD C1 C9 06 D0 04 A2 25
C2B8: E3 A0 0F AD BD C1 C9 07 4A
C2C0: D0 04 A2 E5 A0 05 8E F9 4C
C2C8: 07 8C BE C1 20 69 C1 20 48
C2D0: 59 C0 60 20 37 C0 AD BD CE
C2D8: C1 C9 00 D0 2B AD 03 D0 E1
C2E0: C9 42 D0 EE AD 02 D0 C9 F6
C2E8: 46 F0 E7 A0 00 CE 00 D0 48
C2F0: CE 02 D0 AD 02 D0 C9 FF DC
C2F8: D0 05 A9 00 8D 10 D0 20 07
C300: 37 C0 C8 C0 04 D0 E6 60 9D
C308: AD BD C1 C9 01 D0 29 AD A7
C310: 03 D0 C9 42 D0 BC AD 02 2D
C318: D0 C9 3E F0 B5 A0 00 EE 27
C320: 00 D0 EE 02 D0 AD 02 D0 33
C328: D0 05 A9 03 8D 10 D0 20 39
C330: 37 C0 C8 C0 04 D0 E8 60 CF
C338: A2 00 AD 02 D0 DD DD C1 D8
C340: F0 06 E8 E0 04 D0 F3 60 2A
C348: 8E 53 C0 BD E1 C1 8D 1E F7
C350: C1 AD BD C1 C9 02 D0 65 41
C358: AD 03 D0 C9 66 D0 0C AD 94

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C360:	BF	C1	C9	2F	D0	01	60	EE	FB	C530:	00	03	D8	00	1D	00	00	02	2B
C368:	BF	C1	60	A0	00	EE	03	D0	AD	C538:	02	00	00	00	0B	00	02	06	4D
C370:	20	37	C0	C8	C0	04	D0	F5	DC	C540:	01	03	06	07	07	07	07	0A	70
C378:	A2	00	AD	03	D0	DD	E9	C1	26	C548:	FF	E8	2E	80	AE	2A	80	AA	E3
C380:	F0	06	E8	E0	04	D0	F3	60	6A	C550:	2B	BF	BA	3A	C0	28	30	C0	0A
C388:	8E	54	C0	AE	53	C0	BD	F1	9E	C558:	00	30	C0	00	30	C0	00	30	6A
C390:	C1	8D	BA	C3	A9	04	8D	BB	55	C560:	C0	00	30	C0	00	30	C0	00	03
C398:	C3	AE	54	C0	E0	00	F0	17	09	C568:	30	C0	00	35	C0	00	15	40	A4
C3A0:	18	AD	BA	C3	69	28	8D	BA	BE	C570:	00	05	00	00	0A	00	00	02	81
C3A8:	C3	B0	03	4C	B1	C3	EE	BB	8C	C578:	00	00	2A	A0	00	4A	A0	00	2E
C3B0:	C3	CE	54	C0	4C	99	C3	A9	AB	C580:	4A	A0	00	2A	A0	15	40	00	8B
C3B8:	9E	8D	00	60	60	AD	BF	C1	D4	C588:	05	00	00	0A	00	00	08	00	9F
C3C0:	F0	04	CE	BF	C1	60	AD	03	17	C590:	00	0A	00	00	2A	80	00	2F	74
C3C8:	D0	C9	42	F0	51	A0	00	CE	57	C598:	80	00	2A	80	15	40	00	05	1E
C3D0:	03	D0	20	37	C0	C8	C0	04	4A	C5A0:	00	00	0A	00	00	08	00	00	B2
C3D8:	D0	F5	A2	00	AD	03	D0	DD	A1	C5A8:	AA	80	00	AA	E0	00	AA	E0	EA
C3E0:	ED	C1	F0	06	E8	E0	04	D0	26	C5B0:	00	AA	80	35	40	00	05	00	56
C3E8:	F3	60	8E	54	C0	AE	53	C0	A3	C5B8:	00	0A	00	00	08	00	00	0A	D4
C3F0:	BD	F1	C1	8D	1C	C4	A9	04	7E	C5C0:	00	00	2A	80	00	2A	80	00	16
C3F8:	8D	1D	C4	AE	54	C0	E0	00	0D	C5C8:	2A	80	AD	0E	DC	29	FE	8D	C1
C400:	F0	17	18	AD	1C	C4	69	28	40	C5D0:	0E	DC	A5	01	29	FB	85	01	0E
C408:	8D	1C	C4	B0	03	4C	13	C4	4E	C5D8:	A2	00	BD	00	D0	9D	00	30	D7
C410:	EE	1D	C4	CE	54	C0	4C	FB	0D	C5E0:	E8	E0	00	D0	F5	EE	DC	C5	03
C418:	C3	A9	20	8D	00	60	60	AD	A1	C5E8:	EE	DF	C5	AD	DF	C5	C9	37	D1
C420:	03	D0	C9	66	D0	F8	A9	0F	A6	C5F0:	D0	E6	A9	30	8D	DF	C5	A9	5F
C428:	8D	18	D4	A9	81	8D	12	D4	42	C5F8:	D0	8D	DC	C5	A5	01	09	04	AD
C430:	AE	BF	C1	E8	AD	1E	C1	8D	64	C600:	85	01	AD	0E	DC	09	01	8D	B6
C438:	7E	C4	A9	00	8D	7D	C4	E0	D5	C608:	0E	DC	A2	00	BD	18	C6	9D	CF
C440:	00	F0	15	18	AD	7D	C4	69	B7	C610:	00	34	E8	E0	00	D0	F5	60	35
C448:	14	8D	7D	C4	B0	03	4C	54	80	C618:	AA	AB	AE	BA	AE	AB	AA	AA	87
C450:	C4	EE	7E	C4	CA	4C	3F	C4	62	C620:	AA	EA	BA	AE	BA	EA	AA	AA	1A
C458:	A9	00	8D	52	C0	20	59	C0	DC	C628:	AA	AE	AE	AE	BF	AE	AA	AA	A2
C460:	20	37	C0	EE	52	C0	AD	52	7A	C630:	AA	BA	FE	BA	BA	BA	AA	AA	1A
C468:	C0	C9	0A	D0	F0	A9	00	8D	F5	C638:	AA	AA	BE	D7	D7	BE	AA	AA	10
C470:	18	D4	8D	12	D4	AE	BE	C1	01	C640:	AA	BA	EE	FE	EE	EE	AA	AA	C6
C478:	E8	E8	A9	9D	9D	00	60	60	EF	C648:	AA	FE	EA	EA	EA	FE	AA	AA	07
C480:	A2	00	8A	9D	00	38	9D	C0	E1	C650:	AA	FE	EA	FA	EA	FE	AA	AA	1F
C488:	38	E8	E0	C0	D0	F5	A2	00	B4	C658:	AA	BA	BA	BA	BA	BA	AA	AA	FD
C490:	BD	47	C5	9D	00	38	E8	E0	FA	C660:	AA	EE	FE	EE	EE	EE	AA	AA	1B
C498:	0F	D0	F5	A2	00	BD	56	C5	EA	C668:	AA	FE	EE	FE	EA	EA	AA	AA	2B
C4A0:	9D	80	38	9D	C0	38	9D	00	2B	C670:	AA	FE	EE	FA	EE	EE	AA	AA	37
C4A8:	39	9D	40	39	E8	E0	18	D0	AB	C678:	AA	FE	EA	FE	AE	FE	AA	AA	0F
C4B0:	EC	A2	00	BD	6E	C5	9D	98	68	C680:	AA	EE	EE	EE	BA	BA	AA	AA	C2
C4B8:	38	BD	85	C5	9D	D8	38	BD	66	C688:	AA	EE	EE	EE	FE	EE	AA	AA	43
C4C0:	9C	C5	9D	18	39	BD	B3	C5	49	C690:	AA	EE	EE	BA	BA	BA	AA	AA	9E
C4C8:	9D	58	39	E8	E0	17	D0	E3	8D	C698:	AA	AA	AA	BE	AA	AA	AA	AA	02
C4D0:	A9	E0	8D	F8	07	A9	E2	8D	03	C6A0:	FD	FD	F7	F7	DF	DF	7F	7F	4B
C4D8:	F9	07	A9	00	8D	51	C0	8D	B0	C6A8:	7F	7F	DF	DF	F7	F7	FD	FD	53
C4E0:	BE	C1	8D	BF	C1	8D	BD	C1	7D	C6B0:	55	55	55	55	55	55	55	55	5B
C4E8:	A2	00	BD	1C	C5	9D	00	D0	99	C6B8:	00	00	C0	C0	F0	F0	FC	FF	19
C4F0:	E8	E0	2B	D0	F5	A2	00	BD	0D	C6C0:	00	00	03	03	0F	0F	3F	FF	24
C4F8:	03	C5	9D	00	D4	E8	E0	19	17	C6C8:	82	82	82	82	82	82	82	82	DC
C500:	D0	F5	60	00	00	00	00	00	27	C6D0:	AA	BF	E0	38	0E	02	FF	AA	0F
C508:	00	00	00	00	00	00	00	00	08	C6D8:	AA	FE	0B	2C	B0	80	FF	AA	95
C510:	00	80	FF	00	00	80	80	80	12	C6E0:	AA	BF	E0	38	0E	02	FF	FF	74
C518:	00	00	00	00	3E	3D	3E	42	14	C6E8:	D5	FF	5D	FF	D5	FF	5D	FF	4F
C520:	00	00	00	00	00	00	00	00	20	C6F0:	75	FF	57	FF	75	FF	57	FF	8A
C528:	00	00	00	00	03	1B	00	00	46	C6F8:	65	8A	D7	A0	65	0A	D7	2A	D2


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C700: 5D D7 75 5D D7 75 5D D7 8A C8C0: C9 9D 2C 71 BD 8E C9 9D 79
C708: C3 C3 C3 C3 C3 C3 C3 C3 26 C8C8: 54 71 E8 E0 05 D0 CA A9 A2
C710: AA AA AA AA AA AA AA AA 65 C8D0: 01 8D 42 71 A9 00 8D 54 9E
C718: A9 99 20 D2 FF A9 93 20 AB C8D8: C0 20 E7 C8 EE 54 C0 AD 1C
C720: D2 FF A2 00 A9 A0 9D 68 E5 C8E0: 54 C0 C9 0A D0 F3 60 20 0F
C728: 05 9D 67 06 9D E8 06 E8 AD C8E8: 2C C9 BD E1 C1 8D 2A C9 C1
C730: E0 00 D0 F2 A2 00 A9 0B 2C C8F0: A9 00 8D 29 C9 20 37 C0 33
C738: 9D A0 D9 9D A6 D9 18 8A 11 C8F8: AD 1B D4 C9 2D B0 F6 8D C2
C740: 69 28 AA E0 C8 D0 EF A2 89 C900: 53 C0 C9 02 90 EF 18 AD 26
C748: 00 A9 0B 9D A1 D9 9D 41 F4 C908: 29 C9 69 14 8D 29 C9 B0 A9
C750: DA A9 A0 9D 1D 05 9D 25 F7 C910: 03 4C 17 C9 EE 2A C9 CE F1
C758: 05 9D 2D 05 9D 35 05 9D A2 C918: 53 C0 AD 53 C0 D0 E7 20 C6
C760: 45 05 9D 4D 05 9D 55 05 92 C920: 2C C9 BD E5 C1 AA A9 9C 6C
C768: 9D 5D 05 A9 0F 9D C9 D9 62 C928: 9D 00 60 60 20 37 C0 AD 4C
C770: 9D F1 D9 9D 19 DA E8 E0 35 C930: 1B D4 8D 52 C0 C9 40 B0 7B
C778: 05 D0 CE A2 01 A9 98 9D A0 C938: 03 A2 00 60 AD 52 C0 C9 C8
C780: 55 04 E8 A9 97 9D 55 04 FA C940: 80 B0 03 A2 01 60 AD 52 78
C788: E8 E0 23 D0 F0 A2 00 A9 83 C948: C0 C9 C0 B0 03 A2 02 60 4C
C790: 09 9D 50 D8 A9 0A 9D F0 A2 C950: A2 03 60 9F 8C 8A 8B 85 1E
C798: D8 9D 18 D9 9D 40 D9 E8 A1 C958: 8F 90 86 85 89 9F 9F 9F EC
C7A0: E0 28 D0 EB A9 94 8D F5 28 C960: 9F 8D 88 87 8E 9F 9F 9F 0B
C7A8: 04 8D FD 04 8D 05 05 8D 61 C968: 9F 9F 9F 8B 87 8A 85 88 F2
C7B0: 0D 05 A9 95 8D F9 04 8D 1B C970: 8B 9F 9F 9F 9F 84 9F 80 1F
C7B8: 01 05 8D 09 05 8D 11 05 FD C978: 9F 9F 9F 81 9F 84 9F 20 BC
C7C0: A2 00 BD 53 C9 9D 8E 06 70 C980: 01 0C 0C 20 03 0C 05 01 CE
C7C8: BD 5E C9 9D 06 07 BD 69 80 C988: 12 10 12 05 13 13 20 0B 13
C7D0: C9 9D 7E 07 BD 74 C9 9D 57 C990: 05 19 20 00 00 00 00 00 CE
C7D8: B6 06 9D DE 06 9D 2E 07 EA
C7E0: 9D 56 07 A9 9F 9D 66 06 2F
C7E8: 9D A6 07 A9 08 9D 8E DA EC
C7F0: 9D 06 DB 9D 7E DB 9D B6 BC
C7F8: DA 9D DE DA 9D 2E DB 9D 70
C800: 56 DB 9D A6 DB E8 E0 0B 27
C808: D0 B8 A9 82 8D E1 06 8D C0
C810: 59 07 A9 83 8D E5 06 8D A4
C818: 5D 07 A9 84 8D AB 07 A9 94
C820: 99 8D 57 04 8D 5F 04 8D 21
C828: 67 04 8D 6F 04 A2 00 A9 E0
C830: 0E 9D 7F D8 9D A7 D8 9D EF
C838: CF D8 E8 E0 19 D0 F2 8D 15
C840: F7 D8 8D FF D8 8D 07 D9 E5
C848: 8D 0F D9 A0 00 A2 00 A9 AB
C850: 9A 9D 00 60 C8 C0 06 D0 49
C858: 05 A0 00 4C 72 C8 AD 50 83
C860: C8 C9 9B F0 08 A9 9B 8D 5A
C868: 50 C8 4C 72 C8 A9 9A 8D DA
C870: 50 C8 E8 E0 00 D0 D8 EE EB
C878: 53 C8 AD 53 C8 C9 70 D0 69
C880: CC A9 60 8D 53 C8 A9 00 AA
C888: 8D 52 C8 A2 00 A9 20 9D 3B
C890: B4 70 E8 E0 00 D0 F8 A2 EB
C898: 00 A9 91 9D 00 70 9D 14 93
C8A0: 70 9D 50 70 9D 78 70 A9 9F
C8A8: 92 9D 28 70 9D 3C 70 9D 59
C8B0: 64 70 BD 7F C9 9D DC 70 77
C8B8: BD 84 C9 9D 04 71 BD 89 1F

```

A RAINBOW OF DATA STRUCTURES FROM PAGE 20

LINKED LIST SHOWOFF

```

.10 REM ===== GC
.20 REM LINKED LIST SHOWOFF NK
.30 REM RUPERT REPORT #46 OH
.40 REM ===== BI
.50 NUM=50 :REM NUMBER OF ODD INTEGERS JN
.60 DIM NFO(2*NUM),LNK(2*NUM),A(2*NUM) IJ
.70 REM - CREATE LINKED LIST OF 50 ODD BK
.80 REM INTEGERS FROM 1 TO 99 KI
.90 T0=TI DH
.100 PRINT"WORKING ON LINKED LIST [3"."]" KE
.110 FOR K=1 TO NUM LC
.120 LNK(K)=K+1 : NFO(K)=2*K-1 : NEXT ND
.130 LNK(K-1)=-1 :REM LAST LINK CK
.140 REM BN
.150 REM - INSERT EVEN INTEGERS N INTO JG
.160 REM LIST WITH SUBSCRIPTS 51-100 DD
.170 NXT=NUM+1 : PREV=1 : N=2 CG
.180 OLDLNK=LNK(PREV) : LNK(PREV)=NXT JA
.190 NFO(NXT)=N : LNK(NXT)=OLDLNK FG
.200 PREV=PREV+1 : N=N+2 BP
.210 NXT=NXT+1:IF LNK(NXT-1)<>-1 THEN 180 KE

```



```

•220 REM
•230 REM - DELETE ODD INTEGERS FROM LIST
•240 REM THEY HAVE SUBSCRIPTS 1-50
•250 FIRST=LNK(1) : REM MOVE FIRST POINTER
•260 K=FIRST : LNK(1)=-1
•270 OLDLNK=LNK(K) : LNK(K)=LNK(OLDLNK)
•280 LNK(OLDLNK)=-1
•290 K=K+1 : IF LNK(K)<>-1 THEN 270
•300 REM
•310 REM - PRINT LINKED LIST
•320 K=FIRST
•330 PRINT NFO(K);
•340 K=K+1 : IF LNK(K-1)<>-1 THEN 330
•350 TL=(TI-T0)/60 : PRINT
•360 PRINT "LINKED LIST TOOK "TL"SECONDS"
•370 REM =====
•380 REM - CREATE ARRAY OF 50 ODD
•390 REM INTEGERS FROM 1 TO 99
•400 T0=TI
•410 PRINT : PRINT"WORKING ON ARRAY [3"."
]
•420 FOR K=1 TO NUM
•430 A(K)=2*K-1 : NEXT
•440 REM
•450 REM -INSERT EVEN INTEGERS N WITH
•460 REM SUBSCRIPTS 2-100 BY 2'S
•470 P=2 : REM POINTER TO NEXT ELEMENT
•480 REM - MOVE ALL ITEMS UP
•490 FOR K=NUM+1 TO P+1 STEP -1
•500 A(K)=A(K-1) : NEXT
•510 REM - INSERT NEW INTEGER
•520 A(P)=P : P=P+2 : IF P<=2*NUM THEN 490
•530 REM - DELETE ODD INTEGERS
•540 P=1 : LAST=NUM*2
•550 REM - MOVE ALL ITEMS DOWN
•560 FOR K=P TO LAST-1
•570 A(K)=A(K+1) : NEXT
•580 LAST=LAST-1 : P=P+1
•590 IF LAST>=NUM THEN 560
•600 REM - PRINT ARRAY
•610 REM
•620 FOR K=1 TO NUM
•630 PRINT A(K); : NEXT
•640 TA=(TI-T0)/60 : PRINT
•650 PRINT "ARRAY TOOK " TA "SECONDS"

```

GN	C018:	85	3C	A2	0E	A0	00	B1	39	16
FM	C020:	91	3B	C8	C0	40	90	F7	18	57
CD	C028:	98	65	39	85	39	A5	3A	69	67
JA	C030:	00	85	3A	18	98	65	3B	85	C6
MP	C038:	3B	A5	3C	69	00	85	3C	CA	4B
FK	C040:	D0	DA	A0	18	B9	CD	C5	99	8B
MF	C048:	00	D4	88	10	F7	A9	E6	A0	DE
NK	C050:	C5	20	1E	AB	A9	00	8D	17	4E
LK	C058:	D0	8D	1B	D0	8D	20	D0	8D	AE
HH	C060:	21	D0	A9	FC	8D	1D	D0	A9	1E
ML	C068:	07	8D	25	D0	A9	09	8D	26	59
KJ	C070:	D0	A9	0A	8D	27	D0	A9	FF	24
OI	C078:	8D	1C	D0	8D	15	D0	20	D5	5C
KN	C080:	C4	A9	33	8D	17	04	A9	00	74
KC	C088:	8D	35	C5	A0	1E	A9	00	99	13
AI	C090:	46	C5	88	10	FA	A2	01	A0	74
EC	C098:	00	18	20	F0	FF	A9	17	85	08
DD	C0A0:	02	A9	3E	A0	C6	20	1E	AB	DB
FK	C0A8:	C6	02	D0	F5	A0	05	A9	EF	77
DI	C0B0:	99	FA	07	AD	1B	D4	29	70	83
PP	C0B8:	18	69	46	99	48	C5	AD	1B	F0
AC	C0C0:	D4	29	07	AA	BD	B9	C5	99	47
EG	C0C8:	29	D0	29	01	99	4E	C5	BE	59
IH	C0D0:	AD	C5	A9	00	9D	77	D8	B9	95
HB	C0D8:	B3	C5	9D	77	04	A9	07	9D	B9
OF	C0E0:	78	D8	A9	57	9D	78	04	88	D5
OH	C0E8:	10	C4	A9	18	8D	36	C5	A9	B2
IN	C0F0:	00	8D	3E	C5	A9	F4	8D	F8	A7
AN	C0F8:	07	AD	48	C5	8D	46	C5	A9	FE
KI	C100:	FF	8D	5B	C5	AD	8D	02	D0	BC
JM	C108:	FB	E6	04	A5	04	29	0F	D0	A1
JA	C110:	0B	AD	62	C5	F0	06	CE	62	19
CJ	C118:	C5	20	A2	C4	AD	5E	C5	F0	28
OE	C120:	06	CE	5E	C5	4C	39	C1	38	98
LD	C128:	A9	28	ED	35	C5	8D	5E	C5	94
FN	C130:	20	3A	C2	20	06	C2	20	69	BF
KB	C138:	C4	AD	5F	C5	D0	06	20	A1	68
NE	C140:	C2	4C	55	C1	A5	04	29	0F	48
DD	C148:	D0	0B	AE	46	C5	E8	E0	FB	A4
PF	C150:	B0	03	8E	46	C5	AD	46	C5	58
LC	C158:	C9	50	B0	07	C9	3F	90	03	C6
OO	C160:	20	D2	C3	20	0A	C5	20	35	5C
KL	C168:	C4	AD	62	C5	D0	50	AD	46	18
FL	C170:	C5	C9	F9	90	36	A9	06	8D	FD
	C178:	00	D4	8D	01	D4	A2	20	8E	02
	C180:	04	D4	E8	8E	04	D4	A9	14	67
	C188:	20	02	C5	A9	03	8D	01	D4	80
	C190:	A2	20	8E	04	D4	E8	8E	04	36
	C198:	D4	A9	3C	20	02	C5	CE	17	21
	C1A0:	04	AD	17	04	C9	31	B0	2B	44
	C1A8:	4C	D6	C1	AD	5B	C5	C9	0A	30
	C1B0:	90	0C	A0	05	BE	AD	C5	BD	E2
	C1B8:	78	04	C9	57	D0	03	4C	04	7A
	C1C0:	C1	88	10	F0	20	04	C4	AC	A1
	C1C8:	35	C5	C8	C8	C0	28	B0	03	F1
	C1D0:	8C	35	C5	4C	8B	C0	A9	00	9A
	C1D8:	85	C6	A2	03	A0	0E	18	20	B1
	C1E0:	F0	FF	EE	86	02	A0	00	B9	A3

PLATFORMS FROM PAGE 16

Starting address in hex: C000

Ending address in hex: CA27

SYS to start: 49152

Flankspeed required for entry! See page 95.

```

C000: A9 8E 20 D2 FF A9 08 20 FC
C008: D2 FF A9 A6 85 39 A9 C6 5A
C010: 85 3A A9 80 85 3B A9 3B 9F

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C1E8:	67	C6	F0	EE	20	D2	FF	84	6E	C3B8:	C5	A5	02	8D	36	C5	29	0F	E7
C1F0:	02	A9	02	20	02	C5	20	E4	8B	C3C0:	4A	4A	1D	91	C5	8D	F8	07	57
C1F8:	FF	C9	00	D0	06	A4	02	C8	09	C3C8:	60	AD	F8	07	29	FC	8D	F8	83
C200:	4C	E7	C1	4C	7E	C0	A0	05	27	C3D0:	07	60	38	AD	36	C5	E9	12	16
C208:	BE	4E	C5	18	B9	48	C5	7D	38	C3D8:	85	02	AD	3E	C5	E9	00	4A	46
C210:	8A	C5	C9	44	90	16	C9	B8	97	C3E0:	66	02	46	02	46	02	A6	02	82
C218:	B0	12	85	02	AD	1B	D4	0D	0D	C3E8:	BD	78	04	C9	57	D0	14	A9	D2
C220:	1B	D4	F0	08	A5	02	99	48	92	C3F0:	5D	9D	78	04	A9	0B	9D	78	33
C228:	C5	4C	36	C2	B9	4E	C5	49	4A	C3F8:	D8	18	BD	77	04	6D	62	C5	B8
C230:	01	29	01	99	4E	C5	88	10	A1	C400:	8D	62	C5	60	A9	00	8D	00	4D
C238:	CF	60	AD	47	C5	C9	1E	B0	BB	C408:	D4	A0	04	A2	10	8E	04	D4	9B
C240:	37	AD	1B	D4	29	07	C9	06	15	C410:	E8	8E	04	D4	A2	00	BD	C1	82
C248:	B0	56	CD	5D	C5	F0	51	AA	2D	C418:	C5	8D	01	D4	AD	F8	07	29	18
C250:	8E	5D	C5	18	BD	38	C5	69	3F	C420:	FC	1D	C7	C5	8D	F8	07	A9	FE
C258:	13	8D	37	C5	BD	40	C5	69	23	C428:	08	20	02	C5	E8	E0	06	90	78
C260:	00	8D	3F	C5	AD	1B	D4	29	B9	C430:	E5	88	D0	D7	60	A5	04	29	7A
C268:	07	AA	BD	B9	C5	8D	28	D0	DD	C438:	3F	D0	2D	A2	05	BD	54	C5	F4
C270:	A9	FF	8D	5C	C5	8D	47	C5	64	C440:	F0	23	29	01	09	EE	9D	FA	0F
C278:	29	0F	4A	4A	09	F8	8D	F9	CE	C448:	07	DE	54	C5	AD	5B	C5	C9	E0
C280:	07	AC	5D	C5	18	AD	47	C5	2A	C450:	0A	90	12	EC	61	C5	D0	0D	EE
C288:	6D	5C	C5	8D	47	C5	38	E9	D4	C458:	A9	01	8D	5F	C5	AD	F8	07	63
C290:	15	D9	48	C5	B0	0A	A9	02	F3	C460:	09	03	8D	F8	07	CA	10	D5	AA
C298:	8D	5C	C5	A9	32	99	54	C5	D7	C468:	60	AD	64	C5	F0	04	CE	64	C8
C2A0:	60	AD	5B	C5	C9	0A	90	28	5C	C470:	C5	60	AD	63	C5	0A	18	6D	FC
C2A8:	AD	00	DC	29	10	F0	03	4C	AC	C478:	63	C5	A8	B9	75	C6	D0	04	15
C2B0:	6E	C3	8D	5A	C5	8D	5B	C5	3F	C480:	8D	63	C5	60	8D	64	C5	A2	F1
C2B8:	AD	00	DC	29	0C	4A	4A	8D	9A	C488:	10	8E	04	D4	B9	76	C6	F0	E7
C2C0:	60	C5	AA	BD	91	C5	D0	03	7A	C490:	0D	8D	01	D4	B9	77	C6	8D	86
C2C8:	AD	F8	07	09	03	8D	F8	07	10	C498:	00	D4	E8	8E	04	D4	EE	63	10
C2D0:	AC	5B	C5	A5	04	39	75	C5	BC	C4A0:	C5	60	AD	09	04	48	A0	04	6E
C2D8:	D0	0E	18	AD	46	C5	79	7F	82	C4A8:	38	B9	08	04	69	00	C9	3A	14
C2E0:	C5	C9	FB	B0	03	8D	46	C5	B9	C4B0:	90	02	A9	30	99	08	04	88	4B
C2E8:	A5	04	29	0F	D0	2E	AC	60	D6	C4B8:	10	EF	68	CD	09	04	F0	0B	F7
C2F0:	C5	18	AD	36	C5	79	89	C5	41	C4C0:	AC	17	04	C8	C0	3A	B0	03	FF
C2F8:	AA	AD	3E	C5	79	8D	C5	D0	F2	C4C8:	8C	17	04	A0	10	8C	0B	D4	8D
C300:	0D	E0	15	90	0D	8E	36	C5	2B	C4D0:	C8	8C	0B	D4	60	A0	00	B9	C0
C308:	8D	3E	C5	4C	1C	C3	E0	4D	F3	C4D8:	08	04	D9	20	04	F0	05	B0	89
C310:	90	F3	AD	60	C5	49	03	29	DD	C4E0:	0B	4C	F7	C4	C8	C0	06	90	15
C318:	03	8D	60	C5	18	AD	5A	C5	B4	C4E8:	EE	4C	F7	C4	A0	05	B9	08	48
C320:	69	03	A8	AD	5B	C5	69	00	6D	C4F0:	04	99	20	04	88	10	F7	A0	E3
C328:	C9	0A	B0	06	8C	5A	C5	8D	EC	C4F8:	05	A9	30	99	08	04	88	10	16
C330:	5B	C5	A0	05	38	AD	46	C5	E8	C500:	FA	60	18	65	A2	C5	A2	D0	B4
C338:	F9	48	C5	C9	03	B0	2B	38	21	C508:	FC	60	A2	07	8A	0A	A8	BD	0A
C340:	AD	36	C5	F9	95	C5	AD	3E	2B	C510:	46	C5	99	01	D0	BD	36	C5	41
C348:	C5	F9	9B	C5	90	1C	AD	36	F9	C518:	99	00	D0	AD	10	D0	3D	6D	BB
C350:	C5	F9	A1	C5	AD	3E	C5	F9	23	C520:	C5	A8	BD	3E	C5	29	01	F0	6B
C358:	A7	C5	B0	0E	B9	54	C5	D0	29	C528:	05	98	1D	65	C5	A8	8C	10	53
C360:	08	A9	FF	8D	5B	C5	8C	61	AE	C530:	D0	CA	10	D8	60	00	00	00	15
C368:	C5	60	88	10	C7	60	AC	61	5D	C538:	14	4C	84	BC	F4	2C	00	00	FA
C370:	C5	B9	48	C5	8D	46	C5	A5	3D	C540:	00	00	00	00	00	01	00	00	41
C378:	04	29	1F	D0	54	AD	00	DC	74	C548:	00	00	00	00	00	00	00	00	48
C380:	29	0C	4A	4A	AA	BD	91	C5	0A	C550:	00	00	00	00	00	00	00	00	50
C388:	F0	3F	18	AD	36	C5	7D	89	81	C558:	00	00	00	00	00	00	00	00	58
C390:	C5	85	02	AD	3E	C5	7D	8D	9A	C560:	00	00	00	00	00	01	02	04	67
C398:	C5	85	03	38	A5	02	F9	95	56	C568:	08	10	20	40	80	FE	FD	FB	5A
C3A0:	C5	A5	03	F9	9B	C5	90	21	1C	C570:	F7	EF	DF	BF	7F	07	0F	1F	AC
C3A8:	A5	02	F9	A1	C5	A5	03	F9	54	C578:	3F	7F	7F	3F	1F	0F	07	FF	2B
C3B0:	A7	C5	B0	15	A5	03	8D	3E	58	C580:	FF	FF	FF	FF	01	01	01	01	84

C588:	01	00	01	FF	00	00	00	FF	8A	C758:	00	00	00	00	00	00	00	00	58
C590:	00	00	F4	F0	00	14	4C	84	5B	C760:	00	00	00	00	00	26	00	00	86
C598:	BC	F4	2C	00	00	00	00	00	76	C768:	00	03	C0	00	02	80	00	02	B0
C5A0:	01	35	6D	A5	DD	15	4D	00	2A	C770:	80	00	00	00	00	01	40	00	32
C5A8:	00	00	00	01	01	02	09	10	C5	C778:	01	40	00	02	00	00	00	C0	7C
C5B0:	17	1E	25	0A	19	32	32	19	AB	C780:	00	03	C0	00	03	C0	00	03	0B
C5B8:	0A	0A	03	04	05	0C	08	0D	F9	C788:	F0	00	00	F0	00	00	C0	00	2B
C5C0:	0E	10	20	40	80	40	20	00	20	C790:	00	00	00	00	00	00	00	00	90
C5C8:	01	02	03	02	01	00	00	00	D1	C798:	00	00	00	00	00	00	00	00	98
C5D0:	00	00	1A	0A	00	32	00	00	27	C7A0:	00	00	00	00	00	26	00	00	C6
C5D8:	00	20	00	FF	FF	00	00	80	79	C7A8:	00	03	C0	00	02	80	00	02	F0
C5E0:	00	00	00	00	00	8F	93	1C	20	C7B0:	80	00	00	00	00	01	50	00	82
C5E8:	20	20	53	43	4F	52	45	20	C6	C7B8:	01	50	00	09	60	00	00	00	73
C5F0:	05	30	30	30	30	30	30	20	37	C7C0:	00	0F	C0	00	0F	C0	00	0C	6C
C5F8:	20	20	1E	4C	49	56	45	53	DB	C7C8:	C0	00	3C	F0	00	00	30	00	E6
C600:	20	05	33	20	20	20	9C	48	9D	C7D0:	00	00	00	00	00	00	00	00	D0
C608:	49	47	48	20	05	30	30	30	96	C7D8:	00	00	00	00	00	00	00	00	D8
C610:	30	30	30	0D	20	95	12	31	A6	C7E0:	00	00	00	00	00	26	00	00	07
C618:	30	30	20	20	20	20	32	35	60	C7E8:	00	03	C0	00	02	80	00	02	31
C620:	30	20	20	20	20	35	30	30	66	C7F0:	80	00	00	10	00	01	54	00	D6
C628:	20	20	20	20	35	30	30	20	5E	C7F8:	25	44	00	01	48	00	00	00	AB
C630:	20	20	20	32	35	30	20	20	68	C800:	00	03	C0	00	0F	C0	00	3C	CF
C638:	20	20	31	30	30	00	0D	97	AE	C808:	FC	00	30	0C	00	F0	00	00	32
C640:	20	20	DD	20	20	20	20	20	FE	C810:	00	00	00	00	00	00	00	00	10
C648:	20	DD	20	20	20	20	20	20	07	C818:	00	00	00	00	00	00	00	00	18
C650:	DD	20	20	20	20	20	20	DD	CC	C820:	00	00	00	00	00	26	00	00	46
C658:	20	20	20	20	20	20	DD	20	17	C828:	00	03	C0	00	02	80	00	02	70
C660:	20	20	20	20	20	DD	00	50	2F	C830:	80	00	00	00	00	05	40	00	F5
C668:	52	45	53	53	20	41	4E	59	AF	C838:	05	40	00	04	60	00	02	00	E3
C670:	20	4B	45	59	00	08	21	11	B4	C840:	00	03	C0	00	03	C0	00	03	CA
C678:	04	16	1A	04	00	00	04	1D	D1	C848:	C0	00	03	C0	00	03	00	00	CF
C680:	86	08	21	11	04	16	1A	04	79	C850:	03	C0	00	00	00	00	00	00	14
C688:	00	00	04	1D	86	08	21	11	6A	C858:	00	00	00	00	00	00	00	00	58
C690:	04	1D	86	02	00	00	04	1D	5B	C860:	00	00	00	00	00	26	00	00	86
C698:	86	08	21	11	03	00	00	08	64	C868:	00	03	C0	00	02	80	00	02	B0
C6A0:	16	1A	04	00	00	00	00	00	D4	C870:	80	00	00	00	00	01	40	00	32
C6A8:	00	00	00	00	00	00	00	00	A8	C878:	01	40	00	00	80	00	03	00	3D
C6B0:	00	00	00	00	00	00	00	00	B0	C880:	00	03	C0	00	03	C0	00	0F	17
C6B8:	00	00	00	00	00	00	00	00	B8	C888:	C0	00	0F	00	00	03	00	00	5B
C6C0:	00	00	00	00	00	00	00	00	C0	C890:	00	00	00	00	00	00	00	00	90
C6C8:	00	00	00	00	00	00	00	00	C8	C898:	00	00	00	00	00	00	00	00	98
C6D0:	15	55	54	1A	AA	A4	1F	FF	18	C8A0:	00	00	00	00	00	26	00	00	C6
C6D8:	F4	05	FF	50	01	41	40	00	A5	C8A8:	00	03	C0	00	02	80	00	02	F0
C6E0:	69	00	00	55	00	26	00	00	C5	C8B0:	80	00	00	00	00	05	40	00	76
C6E8:	00	00	00	00	00	00	00	00	E8	C8B8:	05	40	00	09	60	00	00	00	67
C6F0:	00	00	00	00	00	00	00	00	F0	C8C0:	00	03	F0	00	03	F0	00	03	AB
C6F8:	00	00	00	00	00	00	00	00	F8	C8C8:	30	00	0F	3C	00	0C	00	00	50
C700:	00	00	00	00	00	00	00	00	00	C8D0:	00	00	00	00	00	00	00	00	D0
C708:	00	00	00	00	00	00	00	00	08	C8D8:	00	00	00	00	00	00	00	00	D8
C710:	00	00	00	0A	AA	A0	0F	FF	74	C8E0:	00	00	00	00	00	26	00	00	07
C718:	F0	00	FF	00	00	00	00	00	09	C8E8:	00	03	C0	00	02	80	00	02	31
C720:	28	00	00	00	00	26	00	00	6E	C8F0:	80	00	04	00	00	15	40	00	CA
C728:	00	03	C0	00	02	80	00	02	70	C8F8:	11	58	00	21	40	00	00	00	C3
C730:	80	00	00	00	00	01	50	00	02	C900:	00	03	C0	00	03	F0	00	3F	F6
C738:	01	50	00	09	10	00	00	80	23	C908:	3C	00	30	0C	00	00	0F	00	8F
C740:	00	03	C0	00	03	C0	00	03	CA	C910:	00	00	00	00	00	00	00	00	10
C748:	C0	00	03	C0	00	00	C0	00	8D	C918:	00	00	00	00	00	00	00	00	18
C750:	03	C0	00	00	00	00	00	00	14	C920:	00	00	00	00	00	26	02	80	C8

C928:	00	3A	00	00	20	00	00	B0	33	72,169,77,1543	JC
C930:	00	00	33	00	00	03	80	00	E6	•120 DATA160,203,76,58,203,169,237,72,162	
C938:	03	A0	00	02	80	00	3A	00	98	,245,169,139,1893	BL
C940:	00	20	00	00	B0	00	00	33	44	•130 DATA160,227,141,0,3,140,1,3,104,141,	
C948:	00	00	03	80	00	03	A0	00	6F	50,3,973	AH
C950:	02	80	00	3A	00	00	20	00	2D	•140 DATA142,51,3,169,0,141,0,2,96,173,0,	
C958:	00	B0	00	00	33	00	00	03	3F	2,779	EI
C960:	80	00	03	A0	00	26	20	00	CA	•150 DATA206,0,2,201,64,208,35,32,159,204	
C968:	00	B0	00	00	33	00	00	03	4F	,32,184,1327	CF
C970:	80	00	03	A0	00	02	80	00	17	•160 DATA204,169,13,32,210,255,32,207,255	
C978:	3A	00	00	20	00	00	B0	00	83	,201,13,240,1831	PN
C980:	00	33	00	00	03	80	00	03	3A	•170 DATA6,32,210,255,76,98,203,169,15,32	
C988:	A0	00	02	80	00	3A	00	00	E5	,195,255,1546	DE
C990:	20	00	00	B0	00	00	33	00	94	•180 DATA32,204,255,76,116,164,201,178,24	
C998:	00	03	80	00	03	A0	00	02	C1	0,12,134,251,1863	BO
C9A0:	80	00	3A	00	00	26	33	00	B4	•190 DATA162,203,32,39,203,166,251,76,139	
C9A8:	00	03	80	00	03	A0	00	02	D1	,227,165,45,1708	OA
C9B0:	80	00	3A	00	00	20	00	00	8B	•200 DATA133,2,165,46,166,43,164,44,76,17	
C9B8:	B0	00	00	33	00	00	03	80	20	2,203,160,1374	FI
C9C0:	00	03	A0	00	02	80	00	3A	21	•210 DATA20,185,174,0,153,32,205,136,16,2	
C9C8:	00	00	20	00	00	B0	00	00	99	47,165,174,1507	CO
C9D0:	33	00	00	03	80	00	03	A0	2B	•220 DATA133,2,165,175,166,193,164,194,32	
C9D8:	00	02	80	00	3A	00	00	20	B5	,144,204,32,1604	AO
C9E0:	00	00	B0	00	00	26	03	A0	5B	•230 DATA159,204,169,5,162,8,160,0,32,186	
C9E8:	00	02	80	00	3A	00	00	20	C5	,255,169,1509	AG
C9F0:	00	00	B0	00	00	33	00	00	D4	•240 DATA5,162,205,160,204,32,189,255,32,	
C9F8:	03	80	00	03	A0	00	02	80	A2	192,255,169,1860	AI
CA00:	00	3A	00	00	20	00	00	B0	0B	•250 DATA234,141,40,3,162,5,32,198,255,16	
CA08:	00	00	33	00	00	03	80	00	BE	9,35,133,1407	CF
CA10:	03	A0	00	02	80	00	3A	00	70	•260 DATA251,32,207,255,198,251,208,249,1	
CA18:	00	20	00	00	B0	00	00	33	1C	33,251,32,207,2274	AI
CA20:	00	00	03	80	00	26	00	00	C9	•270 DATA255,133,252,169,5,32,195,255,32,	
										184,204,169,1885	LN
										•280 DATA15,32,195,255,32,204,255,169,237	
										,141,40,3,1578	JK
										•290 DATA169,1,174,30,205,172,31,205,133,	
										2,134,253,1509	EF
										•300 DATA132,254,169,0,162,252,141,27,205	
										,230,253,208,2033	NO
										•310 DATA2,230,254,165,253,205,28,205,208	
										,7,165,254,1976	BC
										•320 DATA205,29,205,240,14,202,208,233,16	
										2,254,230,2,1984	AF
										•330 DATA208,227,238,27,205,208,222,169,2	
										10,160,204,32,2110	MK
										•340 DATA30,171,173,27,205,166,2,32,205,1	
										89,169,229,1598	HJ
										•350 DATA160,204,32,30,171,165,252,166,25	
										1,32,205,189,1857	MJ
										•360 DATA169,13,32,210,255,173,0,2,201,17	
										7,208,3,1443	AA
										•370 DATA76,116,164,169,245,160,204,32,30	
										,171,169,0,1536	CB
										•380 DATA133,198,32,228,255,201,78,240,4,	
										201,89,208,1867	BD
										•390 DATA245,32,210,255,72,169,13,32,210,	

JAM ATTACK FROM PAGE 34

JAM ATTACK 64

•10 REM *** JAM ATTACK 64 *** BUCK CHILDRESS ***	EP
•20 REM *** P.O. BOX 13575 SALEM, OR 97309 ***	OA
•30 PRINTCHR\$(147)"LOADING AND CHECKING DATA LINE:";J=52000	BM
•40 FORB=0TO11:READA	MB
•50 IFB=0THENL=PEEK(64)*256+PEEK(63):PRINTCHR\$(19)TAB(31)L:PRINT	PF
•60 IFA<0ORA>255THEN80	FK
•70 POKEJ+B,A:X=X+A:D=D+1:NEXTB:READA:IFA=XTHEN90	PL
•80 PRINT"ERROR IN DATA LINE:"L:END	MG
•90 X=0:J=J+12:IFD<504THEN40	ME
•100 PRINT"THE DATA IS OK[3"."]":PRINT:PRINT"SYS 52[3"0"] TOGGLES ON AND OFF[3"."]":END	BP
•110 DATA162,203,236,51,3,240,10,169,151,	

	255,104,201,1798	GJ	01,13,240,1513	LH
•400	DATA78,208,3,76,116,164,160,20,185,3	HG	•170 DATA6,32,210,255,76,66,19,32,36,21,7	BG
	2,205,153,1400		6,55,884	
•410	DATA174,0,136,16,247,76,237,245,141,	PC	•180 DATA77,201,178,240,12,134,251,162,19	KP
	29,205,165,1671		,32,7,19,1332	
•420	DATA2,141,28,205,142,30,205,140,31,2	AN	•190 DATA166,251,76,63,77,173,16,18,133,2	DE
	05,96,169,1394		50,173,17,1413	
•430	DATA0,133,144,169,8,32,12,237,169,24	NM	•200 DATA18,166,45,164,46,76,149,19,160,1	AN
	0,32,185,1361		6,185,183,1227	
•440	DATA237,165,144,16,237,104,104,162,5	DB	•210 DATA0,153,57,21,136,16,247,32,219,20	JL
	,76,55,164,1469		,32,204,1137	
•450	DATA169,15,168,162,8,32,186,255,169,	EO	•220 DATA247,153,75,21,136,16,247,165,174	MA
	0,32,189,1385		,133,250,165,1782	
•460	DATA255,32,192,255,162,15,76,198,255	OC	•230 DATA175,166,193,164,194,32,204,20,32	JK
	,36,58,85,1619		,239,20,169,1608	
•470	DATA61,85,13,80,82,79,71,82,65,77,32	LP	•240 DATA0,162,107,133,199,142,40,3,169,5	FE
	,76,803		,162,8,1130	
•480	DATA69,78,71,84,72,32,61,32,0,13,66,	MH	•250 DATA160,0,32,186,255,169,5,162,44,16	OG
	76,654		0,21,32,1226	
•490	DATA79,67,75,83,32,70,82,69,69,32,61	OB	•260 DATA189,255,32,192,255,162,5,32,198,	EJ
	,32,751		255,169,35,1779	
•500	DATA0,13,80,82,79,67,69,69,68,32,87,	NH	•270 DATA133,251,32,207,255,198,251,208,2	LF
	73,719		49,133,251,32,2200	
•510	DATA84,72,32,84,72,69,32,83,65,86,69	OG	•280 DATA207,255,133,252,169,5,32,195,255	AC
	,63,811		,32,204,255,1994	
•520	DATA32,40,89,47,78,41,32,0,65,72,83,	FP	•290 DATA32,15,21,32,36,21,169,110,141,40	JN
	0,579		,3,169,789	
			•300 DATA1,174,53,21,172,54,21,133,250,13	JA
			4,253,132,1398	
			•310 DATA254,169,0,162,252,141,50,21,230,	KN
			253,208,2,1742	
			•320 DATA230,254,165,253,205,51,21,208,7,	FO
			165,254,205,2018	
			•330 DATA52,21,240,14,202,208,233,162,254	FO
			,230,250,208,2074	
			•340 DATA227,238,50,21,208,222,32,129,146	EO
			,13,80,82,1448	
			•350 DATA79,71,82,65,77,32,76,69,78,71,84	IM
			,72,856	
			•360 DATA32,61,32,0,173,50,21,166,250,32,	MM
			50,142,1009	
			•370 DATA32,129,146,13,66,76,79,67,75,83,	AL
			32,70,868	
			•380 DATA82,69,69,32,61,32,0,165,252,166,	KC
			251,32,1211	
			•390 DATA50,142,32,129,146,13,0,173,0,2,2	PI
			01,177,1065	
			•400 DATA208,3,76,55,77,32,129,146,13,80,	LJ
			82,79,980	
			•410 DATA67,69,69,68,32,87,73,84,72,32,84	JO
			,72,809	
			•420 DATA69,32,83,65,86,69,63,32,40,89,47	NE
			,78,753	
			•430 DATA41,32,0,169,0,133,208,32,228,255	JA
			,201,78,1377	
			•440 DATA240,4,201,89,208,245,32,210,255,	DC
			72,32,129,1717	
			•450 DATA146,13,0,104,201,78,208,3,76,55,	

JAM ATTACK 128

•10	REM *** JAM ATTACK 128 *** BUCK CHILD	IJ
	RESS ***	
•20	REM *** P.O. BOX 13575 SALEM, OR 9730	OA
	9 ***	
•30	PRINTCHR\$(147)"LOADING AND CHECKING D	AD
	ATA LINE:":J=4864	
•40	FORB=0TO11:READA	MB
•50	IFB=0THENL=PEEK(66)*256+PEEK(65):PRIN	LB
	TCHR\$(19)TAB(31)L:PRINT	
•60	IFA<0ORA>255THEN80	FK
•70	POKEJ+B,A:X=X+A:D=D+1:NEXTB:READA:IFA	PL
	=XTHEN90	
•80	PRINT"ERROR IN DATA LINE:":L:END	MG
•90	X=0:J=J+12:IFD<564THEN40	OO
•100	PRINT"THE DATA IS OK[3"."]":PRINT:PR	KN
	INT"SYS 4864 TOGGLES ON AND OFF[3"."]:E	
	ND	
•110	DATA162,19,236,51,3,240,10,169,116,7	LD
	2,169,45,1292	
•120	DATA160,19,76,26,19,169,78,72,162,24	OG
	5,169,63,1258	
•130	DATA160,77,141,0,3,140,1,3,104,141,5	BN
	0,3,823	
•140	DATA142,51,3,169,0,141,0,2,96,173,0,	EI
	2,779	
•150	DATA206,0,2,201,64,208,30,32,239,20,	GJ
	169,13,1184	
•160	DATA32,210,255,32,15,21,32,207,255,2	

77,160,1121	NP	•150 POKE55,SL:POKE56,SH:VE=SA+23:VH=INT(VE/256):VL=VE-(256*VH)	AM
•460 DATA16,185,57,21,153,183,0,136,16,247,32,224,1270	LE	•160 GOSUB420:POKESA+13,VL:POKESA+18,VH	HP
•470 DATA20,185,75,21,32,188,247,136,16,247,173,55,1395	LM	•170 A1\$=" LARGER RAM STORAGE AREA 40961 TO 64512"	OK
•480 DATA21,133,198,173,51,21,174,52,21,133,174,134,1285	OE	•180 A2\$="SMALLER RAM STORAGE AREA 53248 TO 64512":C=2:GOSUB400:GOSUB370	JC
•490 DATA175,76,78,245,141,52,21,165,250,141,51,21,1416	FH	•190 IFC=1THEN210	KE
•500 DATA142,53,21,140,54,21,96,165,198,141,55,21,1107	DO	•200 POKE65387,0:POKE65388,208:POKE65389,0:POKE65390,44:SS=1	CJ
•510 DATA165,187,166,188,164,199,133,172,134,173,132,198,2011	DC	•210 A1\$=" [BACKARROW] TO PRECEDE COMMAND S (NORMAL BASIC) "	CO
•520 DATA164,183,96,32,69,168,169,0,133,144,169,8,1335	HA	•220 A2\$=" # TO PRECEDE COMMANDS (FAST LOAD CART)":C=2:GOSUB400:GOSUB370	PO
•530 DATA32,62,227,36,144,48,9,169,240,32,210,228,1437	CF	•230 IFC=1THEN P\$=" [BACKARROW]":GOTO250	IB
•540 DATA165,144,16,230,104,104,162,5,76,63,77,169,1315	FN	•240 POKESA+28,35:P\$=" #"	MA
•550 DATA15,168,162,8,32,186,255,169,0,32,189,255,1471	MJ	•250 PRINT"[CLEAR][DOWN] 64 RAMDRIVE ACTIVATED AT ";SA	KI
•560 DATA32,192,255,162,15,76,198,255,169,15,32,195,1596	IK	•260 SYS SA	DA
•570 DATA255,76,204,255,36,58,85,61,85,65,72,83,1335	AD	•270 PRINT:PRINTP\$"LOAD = LOAD FROM RAMDRIVE	JF
		•280 PRINTP\$"SAVE = SAVE TO RAMDRIVE	HF
		•290 PRINTP\$!"[5" "]= SCRATCH PROGRAM	KJ
		•300 PRINT:PRINT" THE ABOVE REQUIRE A SIX CHARACTER	DE
		•310 PRINT"[3" "]FILENAME ENCLOSED IN QUOTES.	FO
		•320 PRINT:PRINTP\$"\$[5" "]= DIRECTORY":PRINT	NE
		•330 IFSSTHENB\$=" 11,264 ":GOTO350	AI
		•340 B\$=" 23,551 "	CJ
		•350 PRINTB\$"RAM DRIVE STORAGE BYTES FREE .":PRINT	GA
		•360 PRINT"SYS 58451 TO KILL. SYS"SA"TO RE-START":END	BJ
		•370 GETA\$:IFA\$=CHR\$(13)THENRETURN	CJ
		•380 IFA\$="[DOWN]"THENGOSUB400:GOTO370	IP
		•390 GOTO370	KN
		•400 IFC=2THENPRINTR\$C1\$A1\$:PRINTC2\$A2\$:C=1:RETURN	KH
		•410 PRINTC1\$A1\$:PRINTR\$C2\$A2\$:C=2:RETURN	HD
		•420 FORP=SATOSA+188:READA:CK=CK+A:POKEP,A:NEXT	DO
		•430 IF CK=23041THENRETURN	JC
		•440 PRINT"[CLEAR] ERROR IN LOWER ML DATA !":STOP	HJ
		•490 REM * UPPER ML DATA *	BL
		•1000 DATA 0,0,0,0,0,0,0,0,0,0,32,29,255,192,6,240,6,169,4,141	ON
		•1010 DATA 254,3,96,202,224,0,208,3,76,32,253,138,72,165,253,141	HH
		•1020 DATA 24,252,165,254,141,25,252,177,253,141,26,252,200,177	ON
		•1030 DATA 253,141,27,252,162,1,32,55,255,165,253,141,28,252,165	IP

C-64 RAMDRIVE FROM PAGE 36

•10 REM 64RAMDRIVE LOADER & CONFIGURATION BY ANTHONY BERTRAM	JC
•20 :	EO
•30 C1\$="[HOME][8"[DOWN]]":C2\$="[HOME][9"[DOWN]]":R\$="[RVSON]"	PD
•40 PRINT"[CLEAR]LOADING UPPER M.L."	AB
•50 L=64536:CS=0	NJ
•60 READD:IFD=-1THEN75	KK
•70 POKEL,D:CS=CS+D:L=L+1:GOTO60	IB
•75 IFCS<>126147THENPRINT"[CLEAR] DATA ERROR IN UPPER ML DATA!":STOP	DA
•80 PRINT"[CLEAR][DOWN]"TAB(5)"[RVSON]64RAMDRIVE CONFIGURATION MENU"	EI
•90 PRINT"[DOWN] USE CURSOR UP/DOWN KEY TO HIGHLIGHT	JK
•100 PRINT" CHOICE AND PRESS RETURN TO SELECT."	OJ
•110 A1\$="LOCATE LOWER CODE IN CASSETTE BUFFER[3" "]"	NF
•120 A2\$="LOCATE LOWER CODE IN TOP OF BASIC RAM ":C=2:GOSUB400	AC
•130 GOSUB370:IFC=1THENS=828:GOSUB420:GOTO170	JB
•140 TM=PEEK(55)+256*PEEK(56):SA=TM-190:SH=INT(SA/256):SL=SA-(SH*256)	IM

AM
HP
OK
JC
KE
CJ
CO
PO
IB
MA
KI
DA
JF
HF
KJ
DE
FO
NE
AI
CJ
GA
BJ
CJ
IP
KN
KH
HD
DO
JC
HJ
BL
ON
HH
ON
IP

•1040 DATA 254,141,29,252,160,6,177,253,141,30,252,200,177,253 CE
•1050 DATA 141,31,252,56,173,30,252,237,26,252,141,32,252,173 PJ
•1060 DATA 31,252,237,27,252,141,33,252,104,170,160,6,56,177,253 HP
•1070 DATA 237,32,252,145,253,200,177,253,237,33,252,145,253,200 PN
•1080 DATA 56,177,253,237,32,252,145,253,200,177,253,237,33,252 NH
•1090 DATA 145,253,202,240,11,160,10,32,67,255,136,208,250,76 JE
•1100 DATA 127,252,173,30,252,133,251,173,31,252,133,252,173,26 PP
•1110 DATA 252,133,253,173,27,252,133,254,173,107,255,141,115 MP
•1120 DATA 255,173,108,255,141,116,255,32,74,255,173,28,252,133 GC
•1130 DATA 251,173,29,252,133,252,173,24,252,133,253,173,25,252 AG
•1140 DATA 133,254,173,117,255,141,115,255,173,118,255,141,116 PC
•1150 DATA 255,32,74,255,56,173,107,255,237,32,252,141,107,255 HG
•1160 DATA 173,108,255,237,33,252,141,108,255,56,173,117,255,233 KG
•1170 DATA 10,141,117,255,173,118,255,233,0,141,118,255,206,114 MI
•1180 DATA 255,76,252,254,177,253,141,107,255,200,177,253,141 JF
•1190 DATA 108,255,76,9,253,0,0,0,0,0,0,0,0,0,0,0,0 JJ
•1200 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0 FK
•1210 DATA 208,93,169,53,133,1,169,125,133,253,169,255,133,254 GB
•1220 DATA 169,6,133,251,133,249,173,136,2,133,252,169,216,133 JA
•1230 DATA 250,174,114,255,240,55,160,0,177,253,41,63,145,251 PF
•1240 DATA 173,134,2,145,249,200,192,6,208,240,160,10,32,67,255 MF
•1250 DATA 136,208,250,24,165,251,105,40,133,251,165,252,105,0 IF
•1260 DATA 133,252,24,165,249,105,40,133,249,165,250,105,0,133 LJ
•1270 DATA 250,202,208,201,169,0,141,254,3,96,177,122,201,34,240 OC
•1280 DATA 6,169,8,141,254,3,96,32,115,0,177,122,201,32,144,241 HH
•1290 DATA 201,91,176,237,153,118,255,200,192,7,208,238,136,152 LA
•1300 DATA 24,101,122,133,122,165,123,105,0,133,123,160,1,177 DO
•1310 DATA 122,201,34,208,208,32,115,0,173,255,3,201,1,208,55 AK
•1320 DATA 173,114,255,208,6,169,4,141,254,3,96,32,29,255,152 FL

•1330 DATA 240,244,177,253,133,251,200,177,253,133,252,200,177 DN
•1340 DATA 253,141,115,255,200,177,253,141,116,255,165,43,133 AN
•1350 DATA 253,165,44,133,254,32,74,255,169,0,141,254,3,96,201 OB
•1360 DATA 2,240,3,76,34,252,56,165,45,141,115,255,229,43,141 LG
•1370 DATA 112,255,165,46,141,116,255,229,44,141,113,255,56,173 IK
•1380 DATA 109,255,237,112,255,141,111,255,173,110,255,237,113 GK
•1390 DATA 255,13,111,255,176,6,169,1,141,254,3,96,173,114,255 JH
•1400 DATA 240,23,201,12,144,3,76,92,254,32,29,255,192,6,208,6 CN
•1410 DATA 169,2,141,254,3,96,76,137,254,169,125,133,253,169,255 DD
•1420 DATA 133,254,76,147,254,173,117,255,133,253,173,118,255 MJ
•1430 DATA 133,254,160,0,185,119,255,145,253,200,192,6,208,246 OB
•1440 DATA 32,67,255,136,208,250,173,107,255,145,253,32,67,255 OP
•1450 DATA 173,108,255,145,253,32,67,255,24,173,107,255,109,112 GP
•1460 DATA 255,145,253,200,173,108,255,109,113,255,145,253,32 PP
•1470 DATA 67,255,32,67,255,165,253,141,17,255,165,254,141,118 LB
•1480 DATA 255,165,43,133,251,165,44,133,252,173,107,255,133,253 JC
•1490 DATA 173,108,255,133,254,32,74,255,238,114,255,32,67,255 AK
•1500 DATA 165,253,141,107,255,165,254,141,108,255,56,169,0,237 DF
•1510 DATA 107,255,141,109,255,169,252,237,108,255,141,110,255 ML
•1520 DATA 16,8,169,0,141,109,255,141,110,255,169,0,141,254,3 CG
•1530 DATA 96,169,125,133,253,169,255,133,254,174,114,255,160 PA
•1540 DATA 0,177,253,217,119,255,208,6,200,192,6,208,244,96,160 IJ
•1550 DATA 10,32,67,255,136,208,250,202,208,230,96,230,253,208 PJ
•1560 DATA 2,230,254,96,160,0,177,251,145,253,230,251,208,2,230 NO
•1570 DATA 252,230,253,208,2,230,254,165,251,205,115,255,208,233 AB
•1580 DATA 165,252,205,116,255,208,226,96,1,160,255,91,0,0,0,0,0,0,0,0,0,0,0,0 LC
•1590 DATA 0,0 AM
•1990 REM * LOWER ML DATA * ME
•2000 DATA 173,8,3,141,252,3,173,9,3,141 GD
•2010 DATA 253,3,169,83,141,8,3,169,3,141 IP
•2020 DATA 9,3,96,160,1,177,122,201,95,24

IMPORTANT!

Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 93 and 94 explain these codes and provide other essential information on entering **Ahoy!** programs. Refer to these pages **before** entering any programs!

```

0
.2030 DATA 3,108,252,3,32,115,0,177,122
.2040 DATA 201,147,240,15,201,148,240,14
.2050 DATA 201,33,240,13,201,36,240,12,10
8
.2060 DATA 252,3,169,1,44,169,2,44,169,3
.2070 DATA 44,169,4,141,255,3,201,4,208
.2080 DATA 11,169,147,32,210,255,162,13
.2090 DATA 24,32,240,255,32,115,0,169,127
.2100 DATA 141,13,220,165,1,141,73,253,16
9
.2110 DATA 0,133,1,162,7,181,248,157,62
.2120 DATA 253,202,208,248,32,80,253,173
.2130 DATA 255,3,201,1,208,14,165,123,201
.2140 DATA 2,208,8,165,253,133,45,165,254
.2150 DATA 133,46,162,7,189,62,253,149,24
8
.2160 DATA 202,208,248,173,73,253,133,1
.2170 DATA 169,129,141,13,220,173,254,3
.2180 DATA 240,4,170,76,55,164,173,255,3
.2190 DATA 201,1,208,6,165,123,201,2,208
.2200 DATA 3,108,252,3,32,161,225,76,174,
167

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PN [s B]"[s J][s C][s C][s I]" HE
HO .110 PRINTTAB(5)"[RVSON][s J][3"[s C]"[s K]
K][s J][s C][s K][SS][SS][s J][s C][s K]
[s J][s K][SS][SS][s J][s C][s K][s J][
s K][SS][s J][s K][s J][3"[s C]"[s K]" BF
LB .120 PRINTTAB(11)"[c 5]A TRADING ADVENTUR
BL E":PRINTTAB(8)"BY CLEVELAND M. BLAKEMORE
FA ":PRINTTAB(17)"[RVSON][DOWN]C-128[DOWN][
PD DOWN]" DI
.130 PRINTTAB(14)"[3"[DOWN]"[RED]PLEASE
HN WAIT[3"."];:GOSUB1470:GOTO180 OO
NG .140 PRINT"[c 4][c A]";:FORX=.TO36:PRINT"
MP [s C]";:NEXT:PRINT"[c S][LEFT]"CHR$(148)
PJ "[s C]" DG
IP .150 FORX=.TO22:PRINT"[s B] "TAB(38)"[s B
]
HJ [LEFT]"CHR$(148):NEXT:PRINT"[c Z]"; IP
MA .160 FORX=.TO36:PRINT"[s C]";:NEXT:PRINT"
AO [c X][LEFT]"CHR$(148)"[s C][HOME]":RETUR
JP N DL
BO .170 REM INITIALIZATION EI
IE .180 DIM DX(8),DY(8),A$(60),N(8),S(8,8),T
(8,8),AP(8),CH(4,8),C(4) DP
.190 S=1024:C=55296:L=40:M=42:B=32:X=.Y=
.I=32:K=.A=I:V=.J=.OX=.OY=.T=156:B
R=58:W=37:P=38:F=94:U=47:H=14:SS=.SC=.
CS=500.00:BG=.WR=.NI=.BP=. HE
.200 DEFFNS(J)=J+X+(Y*L):DEFFNJ(X)=JOY(2)
AND15:DEFFNO(J)=J+OX+(OY*L):DEFFNN(J)=((
AA PEEK(FNS(S))>47ANDPEEK(FNS(S))<58))
EI .210 DEFFND(J)=(A>47ANDA<58)ORA=5
.220 DEFFNB(J)=(X>39ORX<.ORY>24ORY<.OR(PE
EK(FNS(S))<>BANDPEEK(FNS(S))<>BRANDPEEK(
BN FNS(S))<>WANDPEEK(FNS(S))<>PANDPEEK(FNS(
S))<>FANDPEEK(FNS(S))<>UANDFNN(.).)) MI
.230 FORJ=1TO8:READDX(J),DY(J):NEXT:FORJ=
MJ 1TO60:READA$(J):NEXT
.240 HI$=CHR$(18):OF$=CHR$(146):C$="":L$
="":B$="":FORX=.TO39:C$=C$+"#":L$=L$+"[U
PARROW]":B$=B$+"@" :NEXT:MA$="[RVSON][c 5
] [s P]ER [s I]TEM[9" "][s C]URRENT [s R
]EALM [s V]ALUE ":S$=" SAYS[3"."]" OP
.250 IA$="[RVSON][c 5] [s T]YPE OF [s C]O
MMERCE[6" " ]# IN [s I]NVENTORY ":PUDEF"0
NG "
.260 J=FRE(1):FORX=1TO8:READJ:T(X,J)=-1:R
EADRX:S(X,J)=RX:NEXT:FORJ=1TO8:FORY=.TO7
:IFT(J,Y)<>-1THENT(J,Y)=INT((RND(1)*8)+1
JC ):ELSET(J,Y)=.
.270 NEXT:NEXT:FORJ=.TO8:READAP(J):NEXT:F
ORJ=1TO4:FORY=.TO8:READCH(J,Y):NEXT:NEXT
NF :FORJ=1TO8:READS(J,8):NEXT:FORJ=1TO4:REA
DC(J):NEXT
.280 WINDOW1,21,38,21,1:PRINTTAB(10)"PRES
LA S FIRE TO BEGIN";
.290 X=.Y=1:DO:POKE8192+32*8+X,,:POKE819
2+32*8+Y,60:X=X+1+((X=7)*8):Y=Y+1+((Y=7)

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EMPIRE FROM PAGE 47

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.10 REM EMPIRE/BY CLEVELAND BLAKEMORE AE
.20 REM (C)1986 FOR THE C128 COMPUTER GG
.30 REM VERSION 2.6 EK
.40 COLOR.,1:COLOR4,1:COLOR1,1:COLOR5,3:G
RAPHC1,1:GRAPHIC.:PRINTCHR$(11)CHR$(19)
EJ CHR$(19)CHR$(142)CHR$(147);:GOSUB140
CO .50 REM TITLE SCREEN
.60 PRINTTAB(5)"[c 4][DOWN][DOWN][RVSON][
s U][3"[s C]"[s I][s U][s C][s I][s U][
s I][s U][s C][s I][s U][s C][s C][s I][
s U][s C][s I][s U][s C][s C][s I][SS][s
U][3"[s C]"[s I]" JB
.70 PRINTTAB(5)"[RVSON][s B][s U][s C][s
C][s K][s B][SS][s J][s K][s J][s K][SS]
[s B][s B][s U][s I][s B][s B] [s B][s B]
[s U][s I][s B][SS][s B][s U][s C][s C]
[s K]" HI
.80 PRINTTAB(5)"[RVSON][s B][s J][s I][SS]
[SS][s B][SS][s U][s I][s U][s I][SS][s
B][s B][s J][s K][s B][s B] [s B][s B][
s J][s K][s J][s I][s B][s J][s I] " OF
.90 PRINTTAB(5)"[RVSON][s B][s U][s K][SS]
[SS][s B][SS][s B][s J][s K][s B][SS][s
B][s B][s U][s C][s K][s B] [s B][s B][
s U][s C][s I][s B][s B][s U][s K] " FL
.100 PRINTTAB(5)"[RVSON][s B][s J][s C][s
C][s I][s B][SS][s B][SS][SS][s B][SS][
3"[s B]"[SS][SS][s B] [3"[s B]"[SS][3"

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*8):LOOPUNTILJOY(2)>127	JG	:RETURN:ELSEONIMGOSUB550,710,840,880,940	
•300 FORX=.TO7:POKE8192+32*8+X,.:NEXT	BI	:GOTO530	HB
•310 REM MAIN LOOP	CB	•540 REM BUY	JM
•320 X=.:Y=.:GOSUB1200:CHAR.,X,Y,"[c 8]*" :GOSUB1150:FORSS=1TO4:COLOR4,C(SS):FORSC =.TO250	HN	•550 GOSUB1010:GOSUB1060:PRINT"[c 5]";A\$(26+A);S\$:COLOR5,A+1:IFIM=9ANDSGN(CS)=-1T HENPRINTCHR\$(34);"[s Y]OU CANNOT BUY LAN D ON DEBT NOTES.";CHR\$(34):RETURN	OE
•330 J=FNJ(.):OX=X:OY=Y:IFJTHENX=X+DX(J): Y=Y+DY(J):IFFNB(.)=.THENI=A:K=V:A=PEEK(F NS(S)):V=PEEK(FNS(C)):SOUND1,2000,1:ELSE X=OX:Y=OY:FORJ=.TOT:NEXT	CG	•560 IFT(A,IM-1)THENPRINTCHR\$(34);"[s W]E DO NOT DEAL IN ";A\$(17+IM);".";CHR\$(34) :RETURN:ELSEPRINTCHR\$(34);"[s H]OW MANY WOULD YOU LIKE TO PURCHASE.";CHR\$(34)	GI
•340 IFA=47THENM=41:ELSEIFA=37ORA=38THENM =39:ELSEM=42	DM	•570 PRINTCHR\$(34);"[s W]E HAVE ";:PRINTU SING"[4"#""]";S(A,IM-1);:PRINT" ";A\$(17+I M);" TO SELL.";CHR\$(34)	PA
•350 IFX<>OX OR Y<>OYTHENCHAR.,X,Y,CHR\$(M):POKEFNS(C),15:POKEFNO(C),K:POKEFNO(S), I	CL	•580 PRINT"[c 5][RVSON][s S]ELECT # [s I] TEMS [RVSOFF][c 8]";:UL=S(A,IM-1):GOSUB1 080:PRINT:IFBGTHENNI=BG:ELSECOLOR5,A+1:P RINT:PRINTCHR\$(34);"[s A]H,WELL[3"."]";C HR\$(34):RETURN	JN
•360 H=T-H:PRINTCHR\$(H);:IFJOY(2)>127ANDF ND(.):THENGOSUB490:GOSUB1200:CHAR.,X,Y,"[c 8]*"	NJ	•590 BP=AP(IM-1)+CH(SS,IM-1):IC=INT(BP/8) :WR=.:BG=.:ASK=BP+IC*8:DO:PRINT"[c 5]";A \$(26+A);S\$:COLOR5,A+1:PRINTCHR\$(34);A\$(5 0.5+RND(1));	AE
•370 NEXT:NEXT:PRINT"[HOME][HOME][CLEAR]" ;CHR\$(7);:GOSUB950:J=(N(8)/2700)*100	HD	•600 PRINTUSING"[5"#""]";ASK;:PRINT" EACH. ";CHR\$(34)	HA
•380 PRINT"[HOME][HOME]"TAB(10)"[c 7][RVS ON] [s Y]EAR'S END [s R]ESULTS ":PRINT"[RIGHT][RIGHT][DOWN][DOWN][c 8][s Y]OU HA VE ACQUIRED [RVSON][c 3]";:PRINTUSING"[3 #""]";J;:PRINT"%[RVSOFF][c 8] OF THE [c 3][s E]MPIRE!":GOSUB1150:GOSUB990:GOTO22 50	BN	•610 PRINT"[RVSON][s Y]OUR [s O]FFER?[c 8] \$";:UL=BP+IC*8:GOSUB1080:PRINT:IFBG>A SK-IC*.5THENEXIT:ELSEIFBG>ASK-IC*4THENAS K=BG+IC	JB
•390 REM MENU SUBROUTINE	FG	•620 SOUND1,22000,10,2,900,2000,1:COLOR5, A+1:IFBG>IC*8THENSER=8:ELSESER=INT(BG/IC)	AB
•400 PRINTCHR\$(147)"[c 8]";TAB(18-(LEN(A\$()/2))HI\$;A\$:PRINT:FORIM=.TONM-1:COLOR5,I M+2:PRINTTAB(18-(LEN(A\$(BM+IM)))/2);A\$(B M+IM):NEXT:IM=.	HA	•630 PRINT:PRINT"[c 5]"A\$(26+A);S\$:COLOR5 ,A+1:PRINTCHR\$(34);"[s N]AY,";A\$(17-SR); CHR\$(34)	CD
•410 XM=IM:COLOR5,IM+2:CHAR.,(18-(LEN(A\$(BM+IM)))/2)),IM+2,HI\$+A\$(BM+IM)	GO	•640 WR=WR+1:LOOPUNTILWR=10:PRINT:IFWR=10 ORBG<ASK-IC*.5THENPRINTCHR\$(34);"[s N]AY ![s E]NOUGH OF THIS BARGAINING!":RETURN	DG
•420 J=JOY(2):IFJ=.THEN420:ELSESOUND1,500 0,1,.,.,.	DA	•650 PRINT"[c 5]";A\$(26+A);S\$;:COLOR5,A+1 :PRINT:SOUND1,5000,20,1,10,1000,.:IFBG>I C*8THENSER=8:ELSESER=INT(BG/IC)	PG
•430 IFJAND128THENSOUND1,15000,20,2,200,9 000,.:IM=IM+1:XM=FRE(1):RETURN	LJ	•660 IFIM=9ANDSGN(CS-NI*BG)=-1THENPRINTCH R\$(34);"[s I] DO NOT ACCEPT DEBT NOTES O N LAND,MY FRIEND.";CHR\$(34):RETURN	DJ
•440 IFJ=5THENIM=IM+1:IFIM=NMTHENIM=.	IN	•670 IFCS-NI*BG<-5000THENPRINTCHR\$(34);"[s T]HE [s M]ERCHANT [s G]UILD CAN ISSUE YOU NO MORE THAN 5[3"0"] DOLLARS WORTH OF DEBT NOTES.";CHR\$(34):RETURN	HJ
•450 IFJ=1THENIM=IM-1:IFIM<.THENIM=NM-1	AK	•680 PRINTCHR\$(34);"[s A]YE,";A\$(17-SR);C HR\$(34):PRINT"[WHITE][s S]OLD."S(A,IM-1)=S(A,IM-1)-NI:CS=CS-(NI*BG):N(IM-1)=N(I M-1)+NI:SLEEP4:GOSUB940:RETURN	FP
•460 CHAR.,(18-(LEN(A\$(BM+XM)))/2)),XM+2,0 F\$+A\$(BM+XM):PRINT	HL	•690 RETURN	EC
•470 GOTO410	PE	•700 REM SELL	IB
•480 REM HANDLE INDIVIDUAL LOCATIONS	FF	•710 GOSUB1010:GOSUB1060:IFN(IM-1)=.THENP RINT"[c 5]";A\$(26+A);S\$:COLOR5,A+1:PRINT CHR\$(34);"[s Y]OU DO NOT HAVE ANY ";A\$(1 7+IM);"!";CHR\$(34):RETURN	NG
•490 A=A-48:COLOR4,1:COLOR5,A+1:PRINTCHR\$(147);B\$;CHR\$(14):FORJ=1TO23:PRINT"@TAB (39)"@":NEXT:CHAR.,1,17,LEFT\$(B\$,38):CHA R.,39,23,B\$:POKE2023,.:POKE56295,A	HO	•720 NI=INT(N(IM-1)*(T(A,IM-1)*.124))	OK
•500 PRINTCHR\$(19);TAB(20-(LEN(A\$(A))/2)) ;HI\$;A\$(A)	JN		
•510 A\$="[c 5][DOWN][s R]EPRESENTATIVE [c 8]"A\$(26+A):PRINTTAB(21-(LEN(A\$)/2));A \$	KD		
•520 PRINTTAB(21-((18+LEN(A\$(26+A)))/2)+1 5);"[WHITE]";LEFT\$(L\$,LEN(A\$(26+A)));"[c 5]"	JB		
•530 GOSUB1040:BM=44:NM=6:A\$="[s M]ERCHAN TRY":GOSUB400:IFIM=6THENE=.:COLOR4,C(SS)			

•730 PRINT"[c 5]";A\$(26+A);S\$:COLOR5,A+1	LK	S FIRE TO CONTINUE.";:DO:LOOPUNTILJOY(2)	
•740 IFNITHENPRINTCHR\$(34);"[s W]E WILL B		>127:RETURN	GE
UY ";:PRINTUSING"[4"#""];NI;:PRINT" ";A\$(•930 REM INVENTORY	AC
(17+IM);" FROM YOU.";CHR\$(34):SLEEP3:ELS		•940 GOSUB950:GOSUB990:RETURN	AA
EPRINTCHR\$(34);"[s N]O THANKS.";CHR\$(34)	NM	•950 GOSUB1040:PRINTIA\$:PUDEF" ":FORJ=.TO	
:RETURN		8:COLOR5,J+2:PRINTTAB(1)A\$(18+J)TAB(26);	OM
•750 BP=AP(IM-1)+CH(SS,IM-1):IC=INT(BP/8)		:PRINTUSING"[5"#""];N(J):NEXT:PUDEF"0"	
:WR=.:BG=.:ASK=BP-IC:DO:PRINT"[c 5]";A\$(FA	•960 PRINTTAB(8)"[c 8][DOWN][s P]RESS FIR	NM
26+A);S\$:COLOR5,A+1:PRINTCHR\$(34);A\$(52.		E TO CONTINUE.";:GOSUB1060	
5+RND(1));	NA	•970 PRINT"[DOWN]"TAB(13)"[s C]ASH ON [s	
•760 PRINTUSING"[5"#""];ASK;:PRINT" EACH.		H]AND":PRINTTAB(13)"[RVSON] \$";:PRINTUSI	
";CHR\$(34)	OE	NG"[6"#""].##";ABS(CS);:PRINT" ":IFSGN(CS	
•770 BG=.:DO:COLOR5,A+1:PRINT"[RVSON][s Y)=-1THENPRINTTAB(16)"[RED][DOWN]![s D]EB	KM
]OUR [s O]FFER?[c 8] \$";:UL=BP+IC*8:GOSU	CD	T!":ELSEPRINTTAB(16)"[WHITE][DOWN][s C]R	GF
B1080:PRINT:LOOPUNTILBG:IFBG<=ASK+(IC*.5		EDIT"	CD
)THENEXIT:ELSEIFBG<=ASK+IC*3THENASK=ASK+	EF	•980 RETURN	AH
IC		•990 DO:LOOPUNTILJOY(2)>127:RETURN	CI
•780 SOUND1,22000,10,2,900,2000,1:COLOR5,		•1000 REM COMMERCE TYPE	IN
A+1:IFBG>BP+IC*8THENSER=8:ELSEIFBG>BPTHEN		•1010 BM=18:NM=9:PRINT"[c 8]":A\$=" [s C]O	KE
SER=INT((BG-BP)/IC):ELSESER=.	AK	MMERCE: ":GOSUB400	DK
•790 PRINT:PRINT"[c 5]";A\$(26+A);S\$:COLOR		•1020 RETURN	JM
5,A+1:PRINTCHR\$(34);"[s N]AY,";A\$(9+SR);	EL	•1030 REM MAIN DISPLAY WINDOW	AE
CHR\$(34):SLEEP3		•1040 WINDOW1,5,38,16,1:RETURN	CI
•800 WR=WR+1:LOOPUNTILWR=10:PRINT:IFWR=11		•1050 REM SET CONVERSATIONAL WINDOW	
ORBG>ASK+IC*.5THENPRINT:PRINT"[c 5]";A\$(•1060 WINDOW1,18,38,23,1:PRINTOF\$;:RETURN	
26+A);S\$:COLOR5,A+1:PRINTCHR\$(34);"[s N]		•1070 REM GET VALUE FROM 1-1000 JOYSTICK	
AY!:[s E]NOUGH OF THIS BARGAINING!":RETUR		•1080 DO:LOOPUNTILJOY(2)=.:BG=.:DO:PRINTU	IN
N		SING"[5"#""];BG;:J=JOY(2)	AP
•810 COLOR5,A+1:PRINT:PRINT"[c 5]";A\$(26+		•1090 IFJ=1THENBG=BG-10:IFBG<.THENBG=.	OP
A);S\$:SOUND1,5000,20,1,10,1000,.:IFBG>BP		•1100 IFJ=5THENBG=BG+10:IFBG>ULTHENBG=UL	NH
+IC*8THENSER=8:ELSEIFBG>=BPTHENSER=INT((BG		•1110 IFJ=3THENBG=BG+1:IFBG>ULTHENBG=UL	PF
-BP)/IC):ELSESER=.		•1120 IFJ=7THENBG=BG-1:IFBG<.THENBG=.	
•820 PRINTCHR\$(34);"[s A]YE,";A\$(9+SR);CH		•1130 PRINT"[5"[LEFT]]";:LOOPUNTILJ>127:	OH
R\$(34):PRINT"[WHITE][s S]OLD,";S(A,IM-1)		RETURN	AN
=S(A,IM-1)+NI:T(A,IM-1)=1:CS=CS+(NI*BG):		•1140 REM FANFARE	
N(IM-1)=N(IM-1)-NI:SLEEP4:GOSUB940:RETUR		•1150 R\$="V302WGV2044W\$BV105W\$EV105W\$FV204	BA
N		W\$BV302W\$FV302H\$EV204H\$BV105H\$GQ\$EV204H\$GV3	
•830 REM SEASONAL CHANGES		02H\$CV105Q\$V105H\$FV204H\$BV302H\$D\$BV203H\$BV	
•840 GOSUB1010:GOSUB1060:COLOR5,IM+1:PRIN		104H\$B"	PA
TAB\$(17+IM):FORJ=1TO4:COLOR5,C(J):PRINTHI		•1160 RE\$="V105Q\$V204H\$BV302H\$EV105Q\$BQFV	GF
\$;A\$(53+J);		204H\$BV302Q\$DQCV105Q\$EV105H\$DV202H\$GV301H\$B	
•850 PRINTUSING"[4"#""];ABS(CH(J,IM-1));:		H\$GV202H\$EV104H\$B"	
PRINTOF\$;SPC(2)A\$(59+SGN(CH(J,IM-1)))		•1170 TEMPO 10:VOL8:ENVELOPE.,3,,15,,1:	
•860 NEXT:RETURN		ENVELOPE1,2,3,13,6,,1	
•870 REM INQUIRE		•1180 PLAY"V1T0X0V2T0X0V3T1X0":PLAYR\$:PLA	BJ
•880 GOSUB1010:GOSUB1060		YR\$:PLAYR\$:RETURN	NP
•890 IFIM<9THENJ=T(A,IM-1):PRINT"[c 5]"A\$(•1190 REM MASTER MAP	
26+A);S\$:COLOR5,A+1:PRINTCHR\$(34);A\$(35		•1200 PRINT"[HOME][HOME][CLEAR][RVSOFF][4	
+J);" DEMAND.";CHR\$(34):GOTO910		" "[GREEN](([c 5]<[4"UPARROW]"<[BAC	
•900 COLOR5,A+1:PRINTS(A,8);"[c 5]FURLONG		KARROW] [GREEN]([3" "[c 2]]] [GREEN](
S AT ";:COLOR5,A+1:PRINTHI\$;";AP(8)+CH		[3"(")[c 4]<<[BACKARROW]<<[BACKARROW]	
(SS,8);"[LEFT][RVSOFF] APIECE."		"	IE
•910 GOSUB1040:PRINTMA\$:FORJ=.TO8:COLOR5,		•1210 PRINT"[8" "[c 5][5"+"] [BACKARROW]	
J+2:PRINTTAB(1)A\$(18+J)TAB(26)"[RVSON]\$"		[GREEN]([3" "[c 2]] [GREEN]((([c 4]	
;:PRINTUSING"[4"#""].##";(AP(J)+CH(SS,J)+		;:[BACKARROW][UPARROW][BACKARROW];[BACKA	
RND(1));:IFJ=IM-1THENPRINT"[RVSOFF] [s @		RROW][UPARROW][BACKARROW][BACKARROW][GRE	
]":ELSEPRINT		EN]((";	FB
•920 NEXT:PRINTTAB(8)"[c 8][DOWN][s P]RES		•1220 PRINT" ([4" ")([c 5]+[WHITE][[c 5]	

GE
AC
AA

OM
NM

KM
GF
CD
AH

CI
IN
KE
DK
JM
AE
CI

IN
AP
OP
NH
PF

OH
AN

BA

PA

GF

BJ
NP

IE

FB

```
+ [WHITE][[c 5]+ [BACKARROW] [GREEN](( [
c 2]] [GREEN]( ( [c 4]< <[BACKARROW] <
<[3"[BACKARROW]"[GREEN] ("
LC
*1230 PRINT" [c 2]][5" "][c 5]+[BLACK]1[
c 5]+[BLACK]2[c 5]+< [GREEN]([3" "]( ([c
2]] [GREEN]( ([c 5]++ [c 4][BACKARROW]
[c 5]++ [c 4]< [BLUE][BACKARROW]%"
KH
*1240 PRINT"[c 2]][3" "][13" "][GREEN]([
3" "][c 2]][GREEN]([c 2]][GREEN]([BLUE]&
[c 5]++[c 4]<[UPARROW][UPARROW][c 5]++
[c 4]<[BLUE][3"%"]";
LH
*1250 PRINT" [GREEN]([c 2]][c 4]; [c 2]
] ] [7" "][GREEN]( [c 2]][GREEN]([BLU
E]&&[c 5][7"+"] [c 4]<[BLUE]&[3"%"]";
HO
*1260 PRINT" [c 2]] [c 4]<<>[GREEN]( [c 2
]] [4" "][8" "][GREEN]([BLUE]&&[c 5]++
[c 8]$, [BLACK]3[c 8]$, [c 5]++[c 4]<[BLUE]%
&[3"%"]";
BO
*1270 PRINT" [c 4]<[UPARROW]><[BACKARROW
][c 2]] ] [11" "][GREEN]([BLUE]%%&[c 3
][EP][c 2][3":"] [c 3][EP][BLUE]&[5"%"]&
;
II
*1280 PRINT"[c 2]] [c 4][3"+"] [BACKARROW
] [c 2]][7" "][c 4][RVSON][sEP] [s N][R
VSOFF][BACKARROW][3" "][c 2]][GREEN]([BL
UE]%, [c 3][EP][c 2][3":"] [c 3][EP][BLUE]&
%[c 8][4"<"] [BACKARROW] ";
GO
*1290 PRINT"[c 5]##[c 4]+[c 5]#[c 4]+ [c
5][5"#"<[BACKARROW][c 2]] [c 4][RVSON][
sEP] [s N] [RVSOFF][BACKARROW][5" "][c
3][EP][c 2][3":"] [c 3][EP][BLUE]%%&[c 8]
+<+<<<[BACKARROW]";
NK
*1300 PRINT" [BLUE][[c 4][3"+"] [BLUE][
[[c 5]<<[3" "][c 4]+[PURPLE]#[c 4]+[RVSO
N] [RVSOFF][sEP]>[8" "][c 2]][BLUE]%%&[c
8][4"+"] [BACKARROW]";
DO
*1310 PRINT"[BLUE][ [c 4]+[PURPLE]@[c 4]+
[BACKARROW][BLUE][ [c 5]<<[4" "][c 4][3
"+"] [sEP]<<>[6" "][YELLOW][EP][BLUE]%%&
%[c 8]+[WHITE]#[c 8]++ [GREEN][RVSON] ";
JO
*1320 PRINT"[RVSOFF] [c 4]+[BLACK]6[c 4]
+< [c 5]<<[3" "][GREEN]([c 4]+[PURPLE]
#[c 4]+>[3"<"]>[4" "][c 2][PI][5":"] [BLA
CK]4[c 8][4"+"] [GREEN][RVSON] ";
MD
*1330 PRINT"[RVSOFF] [BLUE][[4" "][[c 5]<
<[GREEN]( [GREEN]([c 4]<[UPARROW][3"+"]
[UPARROW]>[3"<"] [4" "][c 2][PI][BLUE]%%
%[GREEN][c *][RVSON][c *][c 8][RVSOFF]+[
WHITE]#[c 8]++[GREEN][RVSON][sEP] ";
KF
*1340 PRINT"[RVSOFF][6" "][c 5]<<[4" "][c
4]<[UPARROW][UPARROW]+[BLACK]5[c 4]+[UP
ARROW][UPARROW]><[5" "][c 8][EP][BLUE]%%
&[GREEN][RVSON][7" "];
JD
*1350 PRINT"[c 5][RVSOFF]## [3"#"<[3" "
][GREEN]( [c 4][4" [UPARROW]" ] [4" [UPARROW
]" ] [6" "][c 2]][BLUE]%%&&&[GREEN][c *][R
VSON][6" "];
JK
*1360 PRINT"[RVSOFF][11" "][13" "][c 2]
```

```
][BLUE]&&%%&&%%&&%%&&";
CF
*1370 PRINT"[9" "][c 2]<>[3" "][GREEN]([3
" "][4" "][c 2]][BLUE]%%[c 4]<<>[BLUE
]&%%&&[c 4]<<> ";
CC
*1380 PRINT" [c 2]<> [YELLOW]? [c 2]<
> [GREEN]( ([6" "][c 2]][GREEN]([BLUE]&
%[c 4]<[UPARROW]><[BACKARROW]<<><[UPARRO
W]><[BACKARROW]";
MM
*1390 PRINT"[c 2]< ><=><> >[5" "][GREE
N]([3" "][BLUE]&&%%[c 4]+[c 5]#[c 4]+ <
[BLUE]@[c 4]><+[c 5]#[c 4]+ [BACKARROW]"
;
EI
*1400 PRINT" [c 2]<<<[3" "]><><><>[6"/"
][BLUE]&&[3"%"] [c 4][3"+"] [3"+"] [3"+"]
[BACKARROW]";
CI
*1410 PRINT"[c 2]<<< [c 4]-[PURPLE]@[c 4]
- [c 2]><<< ><>[GREEN]]/[//][BLUE][4"%"]
&[c 4]+[c 5]#[c 4][3"+"] [c 5]#[c 4][3"+
"] [c 5]#[c 4]+ [BACKARROW]";
JJ
*1420 PRINT"[GREEN]([c 2]>[GREEN]([c 4]-
[BLACK]7[c 4]-[GREEN]([c 2]<[GREEN]([c 4
]][c 2]>[GREEN]([c 2]<[GREEN]([c 2]>[c
4]]/[//][BLUE]&&[3"%"] [c 4][3"+"] [c 5]#[c
4][3"+"] [c 5]#[c 4][3"+"] [BACKARROW]";
BF
*1430 PRINT"[GREEN][3"(")[3"/"] [CYAN]][
c 4]][GREEN]([c 4]][GREEN]] [c 4]][GREEN]
(/[c 4]][GREEN]]/[//][BLUE]%%&&[3"%"]&[c 4]+
[c 5]#[c 4]++[PURPLE]$, [BLACK]8[PURPLE]$,
[c 4]++[c 5]#[c 4]+<"
NF
*1440 PRINT"[CYAN]][GREEN]([c 4]][15"/"
][BLUE]%%&[4"%"] [c 2][PI][12":"]>[HOME]";
EB
*1450 RETURN
DN
*1460 REM REDEFINED CHARACTERS
JP
*1470 BANK15:SUM=0:FORI=2816TO2869:READJ:
SUM=SUM+J:POKEI,J:NEXT:IFSUM<>7491THENPR
INT"ERROR!":END:ELSESYS2816:POKE2604,PEE
K(2604)AND240OR8:RESTORE1600
LM
*1480 READA:IFA=-1THENRESTORE1600:GOTO149
0:ELSEFORI=.TO7:READB:POKE8192+A*8+I,B:N
EXT:GOTO1480
CE
*1490 READA:IFA=-1THEN1500:ELSEFORI=.TO7:
READB:POKE10240+A*8+I,B:NEXT:GOTO1490
KL
*1500 FORI=1TO6:READA:FORJ=.TO7:POKE10240
+A*8+J,PEEK(8192+A*8+J):NEXTJ,I
AP
*1510 FORI=.TO7:POKE10240+63*8+I,PEEK(819
2+63*8+7-I):NEXT
DC
*1520 FORI=.TO7:POKE10240+37*8+I,PEEK(819
2+37*8+I):POKE10240+38*8+I,PEEK(8192+37*
8+I):NEXT:POKE10240+28*8+1,192:POKE10240
+28*8+2,252:RETURN
PD
*1530 DATA 169,,133,250,133,252,169,208
JM
*1540 DATA 133,251,169,32,133,253,169,252
LM
*1550 DATA 141,185,2,169,16,141,54,11
GM
*1560 DATA 160,,169,250,162,14,32,116
MH
*1570 DATA 255,162,,32,119,255,200,208
ON
*1580 DATA 241,206,54,11,240,7,230,251
CG
*1590 DATA 230,253,76,26,11,96
KN
*1600 DATA0,255,129,189,195,195,189,129,2
```


55

•1610 DATA27,,56,108,130,238,238,254,254

•1620 DATA28,128,200,248,240,128,128,128,128

•1630 DATA29,192,38,148,88,58,29,120,152

•1640 DATA30,255,,,,,,,,,

•1650 DATA31,128,128,128,128,128,128,128,128

•1660 DATA35,36,255,36,36,36,36,255,36

•1670 DATA36,,60,126,66,124,126,66,126

•1680 DATA37,2,132,127,2,20,168,71,136

•1690 DATA38,49,74,132,250,129,80,40,199

•1700 DATA39,,,24,18,28,153,255,126

•1710 DATA40,8,62,93,8,127,62,73,28

•1720 DATA41,24,50,55,125,188,162,34,68

•1730 DATA42,24,24,60,90,153,36,66,195

•1740 DATA43,2,255,32,255,2,255,32,255

•1750 DATA45,170,85,170,85,170,85,170,85

•1760 DATA47,36,,16,68,,16,130,16

•1770 DATA58,255,2,255,8,255,32,255,128

•1780 DATA59,,,,,,,,,255

•1790 DATA60,1,2,4,8,16,32,64,128

•1800 DATA61,17,170,68,16,132,,34,16

•1810 DATA62,128,64,32,16,8,4,2,1

•1820 DATA63,36,,16,68,,16,130,16

•1830 DATA94,1,2,4,8,16,32,64,128

•1840 DATA102,126,000,000,249,249,000,000,126,-1

•1850 REM COPY CHARACTERS TO LOWERCASE

•1860 DATA 233,105,223,95,105,206

•1870 REM X & Y DELTA VECTORS

•1880 DATA 0,-1,1,-1,1,0,1,1,0,1,-1,1,-1,0,-1,-1

•1890 REM LOCATIONS

•1900 DATA "[s C]LERIC'S [s T]EMPLE:[s M]ONASTERY","[s M]ONK'S [s S]TOREHOUSE:[s M]ONASTERY","[s C]ASTLE [s G]OHOLLA","[s M]ERLIN'S [s K]EEP","[s W]ARLORD'S [s H]OLD","[s Z]OMBIE [s T]OWER","[s M]OUNTAINS OF [s F]IRE"

•1910 DATA "[s K]INGDOM OF THE [s O]RCS"

•1920 REM TRADING COMMENTS

•1930 DATA "[s G]ET THEE HENCE,FOOL!","[s S]O BE IT.","[s W]ELL IT IS.","[s W]ELL AND GOOD.","[s F]INE,THO[3" "]","[s T]HOU ART A SHREWD ROGUE.","[s Y]EA GODS!","[s A] POX ON THEE!","[s C]URSE THOU!"

•1940 REM TRADE COMMERCE

•1950 DATA "[s A]RTIFACTS","[s W]EAPONS","[s A]RMOR","[s R]ARE [s M]ETALS","[s H]ORSES","[s S]LAVES","[s F]OOD [s P]RODUCTS","[s F]ABRICS","[s L]AND [s S]HARES"

•1960 REM TRADERS

•1970 DATA "[s C]LERIC","[s M]ONK","[s E]MPEROR [s G]OHOLLA","[s M]ERLIN","[s W]ARLORD [s A]KUZA","[s Z]OMBIE [s M]ASTER","[s D]WARVE [s R]ULER","[s O]RC [s K]ING"

FF

JL

PN

FG

IJ

EK

PF

NG

HO

CP

BG

PF

DA

KF

EM

CP

IN

DO

PD

OO

AD

OD

IC

DA

ME

MD

GK

FE

GM

KK

MC

GE

KI

EF

MF

CM

EM

NF

•1980 REM DEMAND

•1990 DATA "[s N]O","[s N]EGLIGIBLE","[s S]LIGHT","[s L]OW","[s M]EDIOCRE","[s H]IGH","[s V]ERY HIGH","[s E]XTREME","[s I]NCREDIBLE"

•2000 REM CHOICES

•2010 DATA "[s B]UY","[s S]ELL","[s S]EASONAL [s C]HANGES","[s I]NQUIRE","[s I]NVENTORY","[s B]ID [s F]AREWELL"

•2020 REM BARGAINING COMMENTS

•2030 DATA "[s I] LET THEM GO AT ","[s I] GIVE THEM AWAY AT ","[s I] TAKE OFF YOUR HANDS AT ","[s I] CONSENT TO GRANT YOU "

•2040 REM SEASONS

•2050 DATA "[s S]PRING ","[s S]UMMER ","[s F]ALL[3" "]","[s W]INTER "

•2060 REM SEASON ADVANTAGES

•2070 DATA "[s L]OSS!","[s N]O [s C]HANGE .","[s G]AIN!"

•2080 REM SPECIALIZED PRODUCTS

•2090 DATA 7,400,6,250,4,840,0,220,1,325,5,500,3,900,2,475

•2100 REM AVERAGE PRICING RANGES

•2110 DATA 50,75,75,500,100,150,60,40,400

•2120 REM SPRING CHANGES

•2130 DATA -20,-25,-25,-100,+100,+200,+25,-25,+125

•2140 REM SUMMER CHANGES

•2150 DATA +10,.,.,.,+50,+50,-20,-30,-50

•2160 REM FALL CHANGES

•2170 DATA +50,+25,+25,+75,.,.,,-50,.,.

•2180 REM WINTER CHANGES

•2190 DATA +100,+100,+100,-50,+300,-100,+200,+200,-150

•2200 REM LAND OWNERSHIP PER KINGDOM

•2210 REM IN FURLONGS

•2220 DATA 75,175,400,250,125,325,800,550

•2230 REM SEASONAL COLOR CHANGES

•2240 DATA 6,8,9,2

•2250 COLOR4,14:COLOR.,12:COLOR5,14:PRINT "[HOME][HOME][CLEAR]":POKE2604,22:GRAPHIC CLR:PRINTCHR\$(12)CHR\$(142):END

AG

BH

FL

CB

ML

LK

LB

EK

GC

OO

DN

OL

JO

FH

IL

JF

OP

FM

AO

IN

BN

ID

BO

DJ

BM

PD

KH

PE

HOTFOOT

FROM PAGE 38

Starting address in hex: C000

Ending address in hex: C8DF

SYS to start: 49152

Flankspeed required for entry! See page 95.

C000: 20 18 E5 A9 8E 20 D2 FF 49

C008: A9 08 20 D2 FF A2 00 A9 F8

C010: 20 9D 00 88 9D 00 89 9D 1B

C018: 00 8A 9D 00 8B E8 D0 F1 77

C020: A2 00 A9 01 9D 00 D8 9D 81

C028: 00 D9 9D 00 DA 9D 00 DB F3

HOTFOOT FROM PAGE 38

Starting address in hex: C000

Ending address in hex: C8DF

SYS to start: 49152

Flankspeed required for entry! See page 95.

```

C000: 20 18 E5 A9 8E 20 D2 FF 49
C008: A9 08 20 D2 FF A2 00 A9 F8
C010: 20 9D 00 88 9D 00 89 9D 1B
C018: 00 8A 9D 00 8B E8 D0 F1 77
C020: A2 00 A9 01 9D 00 D8 9D 81
C028: 00 D9 9D 00 DA 9D 00 DB F3

```


C030:	E8	D0	F1	A9	00	8D	20	D0	04	C200:	8E	07	DD	A9	51	8D	0F	DD	E8
C038:	A9	00	8D	21	D0	AD	1E	D0	FD	C208:	AD	86	C7	F0	03	4C	76	C5	80
C040:	AD	1F	D0	A2	00	A9	00	9D	C7	C210:	A5	91	C9	7F	D0	0D	A9	7F	97
C048:	00	D4	E8	E0	19	D0	F8	A9	73	C218:	8D	0D	DD	A9	04	8D	88	02	56
C050:	8F	8D	18	D4	A9	FF	8D	0E	9F	C220:	4C	66	FE	AD	00	DC	29	1F	A4
C058:	D4	8D	0F	D4	A9	81	8D	12	69	C228:	C9	1F	F0	DC	C9	1E	D0	06	9D
C060:	D4	A9	84	85	FD	A9	DB	85	F1	C230:	20	8A	C2	4C	08	C2	C9	1D	9B
C068:	FE	A9	00	8D	86	C7	A9	01	97	C238:	D0	06	20	DF	C2	4C	08	C2	E8
C070:	8D	63	C7	A9	30	8D	69	C7	C1	C240:	C9	17	D0	06	20	FC	C2	4C	24
C078:	8D	6B	C7	A9	37	8D	6A	C7	D9	C248:	08	C2	C9	1B	D0	06	20	16	05
C080:	A9	95	8D	00	DD	A9	20	8D	82	C250:	C3	4C	08	C2	C9	16	D0	06	E1
C088:	18	D0	A9	88	8D	88	02	A9	65	C258:	20	FC	C2	4C	08	C2	C9	15	2E
C090:	7F	8D	0D	DC	A9	33	85	01	EA	C260:	D0	06	20	FC	C2	4C	08	C2	2E
C098:	A2	00	BD	00	D0	9D	00	80	E7	C268:	C9	1A	D0	06	20	16	C3	4C	69
C0A0:	BD	00	D1	9D	00	81	BD	00	0D	C270:	08	C2	C9	19	D0	03	20	16	28
C0A8:	D2	9D	00	82	BD	00	D3	9D	CA	C278:	C3	4C	08	C2	48	8A	48	98	07
C0B0:	00	83	BD	00	D4	9D	00	84	E8	C280:	48	20	5C	C3	20	82	C4	4C	BC
C0B8:	BD	00	D5	9D	00	85	BD	00	2D	C288:	51	FE	AD	01	D0	C9	34	F0	47
C0C0:	D6	9D	00	86	BD	00	D7	9D	EE	C290:	4D	38	E9	18	8D	01	D0	20	97
C0C8:	00	87	E8	D0	CD	A9	37	85	3E	C298:	66	C4	20	82	C4	20	A9	C5	BA
C0D0:	01	A9	81	8D	0D	DC	A2	00	17	C2A0:	EE	63	C7	AD	63	C7	C9	08	65
C0D8:	BD	7A	C6	9D	80	81	E8	E0	41	C2A8:	D0	31	A9	7F	8D	0D	DD	20	6C
C0E0:	50	D0	F5	A2	00	BD	87	C7	A7	C2B0:	FB	C4	20	11	C5	AD	97	88	36
C0E8:	9D	00	88	9D	78	88	9D	F0	3C	C2B8:	C9	30	D0	14	AD	98	88	C9	30
C0F0:	88	9D	68	89	9D	E0	89	9D	AE	C2C0:	30	D0	0D	AD	99	88	C9	30	98
C0F8:	58	8A	9D	D0	8A	9D	48	8B	46	C2C8:	D0	06	20	54	C5	20	27	C5	E6
C100:	E8	E0	78	D0	E0	20	5C	C3	34	C2D0:	20	BA	C4	A9	82	8D	0D	DD	15
C108:	A2	00	BD	03	C8	9D	47	88	A1	C2D8:	4C	DE	C2	20	E6	C4	60	AD	A0
C110:	E8	E0	04	D0	F5	A2	00	BD	05	C2E0:	01	D0	C9	DC	F0	15	18	69	E0
C118:	FF	C7	9D	6F	88	E8	E0	04	43	C2E8:	18	8D	01	D0	20	74	C4	20	D9
C120:	D0	F5	A9	30	8D	97	88	8D	FB	C2F0:	82	C4	20	A9	C5	CE	63	C7	C1
C128:	99	88	A9	37	8D	98	88	A9	83	C2F8:	20	E6	C4	60	AD	00	D0	C9	6D
C130:	08	8D	2C	88	8D	2C	D8	A9	B6	C300:	EC	F0	12	18	69	20	8D	00	1F
C138:	0E	8D	74	DB	A9	03	8D	74	D2	C308:	D0	20	4A	C4	20	82	C4	20	8F
C140:	8B	A9	54	85	8B	A9	88	85	92	C310:	A9	C5	20	E6	C4	60	AD	00	59
C148:	8C	A2	00	A0	00	A9	A0	91	F3	C318:	D0	C9	6C	F0	12	38	E9	20	64
C150:	8B	18	A5	8B	69	28	85	8B	C7	C320:	8D	00	D0	20	58	C4	20	A9	85
C158:	A5	8C	69	00	85	8C	E8	E0	CF	C328:	C5	20	82	C4	20	E6	C4	60	81
C160:	13	D0	EA	A9	E4	8D	4C	8B	23	C330:	A2	00	AD	1B	D4	29	03	F0	8D
C168:	A2	00	BD	07	C8	9D	37	89	F6	C338:	F9	C9	01	D0	08	A9	02	9D	1F
C170:	E8	E0	05	D0	F5	A9	30	8D	6D	C340:	5E	C7	4C	56	C3	C9	02	D0	69
C178:	5F	89	8D	60	89	8D	61	89	51	C348:	08	A9	07	9D	5E	C7	4C	56	67
C180:	8D	62	89	A2	00	BD	CA	C6	EB	C350:	C3	A9	01	9D	5E	C7	E8	E0	4C
C188:	9D	00	8C	E8	E0	80	D0	F5	C3	C358:	05	D0	D7	60	A9	0A	85	8B	2B
C190:	A9	30	8D	F8	8B	A9	31	8D	E4	C360:	A9	D8	85	8C	A9	00	8D	64	90
C198:	F9	8B	A9	00	8D	10	D0	A9	DF	C368:	C7	A9	00	8D	65	C7	20	30	E4
C1A0:	00	8D	1D	D0	A9	00	8D	17	6A	C370:	C3	A2	00	A0	00	BD	5E	C7	5B
C1A8:	D0	A9	00	8D	1B	D0	A9	00	46	C378:	91	8B	C8	91	8B	C8	91	8B	61
C1B0:	8D	1C	D0	A9	0A	8D	27	D0	64	C380:	C8	91	8B	C8	E8	E0	05	D0	CE
C1B8:	A9	02	8D	28	D0	A2	AC	A0	DA	C388:	EC	18	A5	8B	69	28	85	8B	61
C1C0:	DC	8E	00	D0	8C	01	D0	A2	FD	C390:	A5	8C	69	00	85	8C	EE	65	92
C1C8:	33	A0	DE	8E	02	D0	8C	03	6C	C398:	C7	AD	65	C7	C9	03	D0	D1	AA
C1D0:	D0	A9	03	8D	15	D0	A9	7C	E7	C3A0:	EE	64	C7	AD	64	C7	C9	08	67
C1D8:	A2	C2	8D	18	03	8E	19	03	91	C3A8:	D0	BF	60	8A	48	18	AD	01	33
C1E0:	A9	7F	8D	0D	DD	A9	82	8D	3C	C3B0:	D0	69	08	8D	01	D0	A0	00	F2
C1E8:	0D	DD	A9	63	A2	02	8D	04	17	C3B8:	B9	A2	8B	99	6C	C7	B9	A2	CA
C1F0:	DD	8E	05	DD	A9	11	8D	0E	96	C3C0:	DB	99	4A	C7	C8	C0	14	D0	B6
C1F8:	DD	A9	00	A2	0B	8D	06	DD	9F	C3C8:	EF	A9	7A	85	8B	A9	8B	85	A8

C3D0:	8C	A9	A2	85	8D	A9	8B	85	77	C5A0:	29	1F	C9	0F	D0	EE	4C	0D	DA
C3D8:	8E	AD	11	D0	10	FB	A2	00	A5	C5A8:	C0	A9	4F	8D	01	D4	A9	07	76
C3E0:	A0	00	20	3A	C4	B1	8B	91	6F	C5B0:	8D	05	D4	A9	80	8D	04	D4	A8
C3E8:	8D	A5	8C	09	50	85	8C	A5	B9	C5B8:	A9	81	8D	04	D4	60	A9	10	64
C3F0:	8E	09	50	85	8E	B1	8B	91	BB	C5C0:	8D	0B	D4	A9	F0	8D	0D	D4	38
C3F8:	8D	A5	8C	29	AF	85	8C	A5	49	C5C8:	A9	11	8D	0B	D4	A9	3C	8D	64
C400:	8E	29	AF	85	8E	C8	C0	14	19	C5D0:	85	C7	EE	85	C7	AD	85	C7	55
C408:	D0	DB	A5	8B	85	8D	A5	8C	2B	C5D8:	C9	FF	F0	0B	8D	08	D4	A2	AB
C410:	85	8E	38	A5	8B	E9	28	85	25	C5E0:	05	20	59	C6	4C	D2	C5	38	43
C418:	8B	A5	8C	E9	00	85	8C	E8	BA	C5E8:	A9	F0	E9	10	A2	64	20	59	FD
C420:	E0	17	D0	BC	A0	00	B9	6C	6C	C5F0:	C6	8D	0D	D4	85	02	A5	02	56
C428:	C7	99	0A	88	B9	4A	C7	99	81	C5F8:	F0	03	4C	EA	C5	60	A9	00	F3
C430:	0A	D8	C8	C0	14	D0	EF	68	D9	C600:	8D	85	C7	A9	12	8D	0B	D4	04
C438:	AA	60	48	A9	32	8D	84	C7	41	C608:	A9	28	8D	0C	D4	A9	4F	8D	CE
C440:	CE	84	C7	AD	84	C7	D0	F8	1F	C610:	08	D4	A9	50	8D	01	D4	A9	F3
C448:	68	60	18	A5	FD	69	04	85	BF	C618:	13	8D	0B	D4	A2	C8	20	59	7D
C450:	FD	A5	FE	69	00	85	FE	60	41	C620:	C6	A9	12	8D	0B	D4	EE	85	84
C458:	38	A5	FD	E9	04	85	FD	A5	4B	C628:	C7	AD	85	C7	C9	0F	D0	E7	7C
C460:	FE	E9	00	85	FE	60	38	A5	0C	C630:	60	A2	00	A9	4F	85	8B	A9	E6
C468:	FD	E9	78	85	FD	A5	FE	E9	DA	C638:	8A	85	8C	A9	20	A0	00	91	D0
C470:	00	85	FE	60	18	A5	FD	69	7A	C640:	8B	C8	C0	09	D0	F9	18	A5	E6
C478:	78	85	FD	A5	FE	69	00	85	08	C648:	8B	69	28	85	8B	A5	8C	69	12
C480:	FE	60	A0	00	B1	FD	29	0F	68	C650:	00	85	8C	E8	E0	09	D0	E3	E9
C488:	C9	01	F0	2D	C9	07	D0	06	19	C658:	60	A0	FF	88	D0	FD	CA	D0	4C
C490:	CE	03	D0	4C	A8	C4	CE	03	BE	C660:	F8	60	48	4F	54	46	4F	4F	8A
C498:	D0	CE	03	D0	CE	03	D0	CE	7D	C668:	54	20	4A	4F	48	4E	20	4B	78
C4A0:	03	D0	CE	03	D0	CE	03	D0	B9	C670:	52	55	54	43	48	20	31	39	82
C4A8:	AD	03	D0	C9	43	B0	0A	A9	9B	C678:	38	37	3C	66	66	66	66	66	24
C4B0:	01	8D	86	C7	A9	42	8D	03	0A	C680:	66	3C	18	38	78	18	18	18	34
C4B8:	D0	60	A2	00	20	AB	C3	E8	05	C688:	18	18	3C	66	06	0C	30	60	FD
C4C0:	E0	15	D0	F8	A9	01	8D	63	1C	C690:	60	7E	3C	66	06	0C	06	06	30
C4C8:	C7	18	A5	FD	69	48	85	FD	81	C698:	66	3C	66	66	66	66	7F	06	5A
C4D0:	A5	FE	69	03	85	FE	A9	00	10	C6A0:	06	06	7E	60	60	7C	06	06	74
C4D8:	8D	06	DD	A9	0B	8D	07	DD	71	C6A8:	66	3C	3C	66	60	7C	66	66	97
C4E0:	A9	51	8D	0F	DD	60	48	8A	89	C6B0:	66	3C	7E	66	0C	18	18	18	8C
C4E8:	48	98	48	A0	AA	A2	FF	CA	CA	C6B8:	18	18	3C	66	66	3C	66	66	FA
C4F0:	D0	FD	88	D0	F8	68	A8	68	8B	C6C0:	66	3C	3C	66	66	3E	06	06	B6
C4F8:	AA	68	60	A2	03	18	BD	5F	47	C6C8:	66	3C	19	B0	00	3D	B6	00	29
C500:	89	7D	80	C7	C9	3A	90	02	E5	C6D0:	3F	F6	C0	1F	FE	C0	1F	FF	C5
C508:	E9	0A	9D	5F	89	CA	10	EE	4C	C6D8:	C0	1F	FF	80	0F	FF	80	07	CF
C510:	60	A2	02	38	BD	97	88	FD	29	C6E0:	FF	80	03	FF	80	03	FF	80	68
C518:	66	C7	C9	30	B0	02	69	0A	66	C6E8:	01	FF	80	01	FF	80	01	FF	EC
C520:	9D	97	88	CA	10	EE	60	A2	AA	C6F0:	80	00	FF	80	00	FF	80	00	72
C528:	02	18	BD	69	C7	7D	66	C7	DC	C6F8:	FF	80	00	7F	00	00	3E	00	37
C530:	C9	3A	90	02	E9	0A	9D	69	C1	C700:	00	00	00	00	00	00	00	00	00
C538:	C7	CA	10	EE	AD	69	C7	8D	36	C708:	00	00	07	FC	00	07	FC	00	10
C540:	97	88	AD	6A	C7	8D	98	88	EE	C710:	07	FC	00	00	00	00	00	00	14
C548:	AD	6B	C7	8D	99	88	A9	DE	61	C718:	00	00	00	00	00	00	00	00	18
C550:	8D	03	D0	60	18	A2	0E	A0	7B	C720:	00	00	00	00	00	00	00	00	20
C558:	1F	20	F0	FF	A2	00	BD	0C	F4	C728:	00	00	00	00	00	00	00	00	28
C560:	C8	F0	07	20	D2	FF	E8	4C	49	C730:	00	00	00	00	00	00	00	00	30
C568:	5E	C5	20	FE	C5	20	31	C6	89	C738:	00	00	00	00	00	00	00	00	38
C570:	A9	00	8D	86	C7	60	A9	7F	7F	C740:	00	00	00	00	00	00	00	00	40
C578:	8D	0D	DD	20	BE	C5	18	A2	50	C748:	00	00	00	00	00	00	00	00	48
C580:	0E	A0	1F	20	F0	FF	A2	00	02	C750:	00	00	00	00	00	00	00	00	50
C588:	BD	77	C8	F0	07	20	D2	FF	71	C758:	00	00	00	00	00	00	00	00	58
C590:	E8	4C	88	C5	A5	91	C9	7F	94	C760:	00	00	00	01	00	00	00	00	61
C598:	D0	03	4C	16	C2	AD	00	DC	1C	C768:	07	30	37	30	00	00	00	00	07

C770:	00	00	00	00	00	00	00	00	70	C828:	9D	46	45	45	54	21	20	4E	7A
C778:	00	00	00	00	00	00	00	00	78	C830:	4F	57	11	9D	9D	9D	9D	9D	FB
C780:	00	00	00	07	00	00	00	20	A7	C838:	9D	9D	9D	9D	54	52	59	20	CE
C788:	20	20	20	20	20	20	20	20	89	C840:	49	54	11	9D	9D	9D	9D	9D	03
C790:	20	A0	A0	A0	EA	A0	A0	A0	5F	C848:	9D	41	47	41	49	4E	11	9D	F5
C798:	EA	A0	A0	A0	EA	A0	A0	A0	32	C850:	9D	9D	9D	9D	57	49	54	48	04
C7A0:	EA	A0	A0	A0	EA	20	20	20	B8	C858:	11	9D	9D	9D	9D	53	45	56	CE
C7A8:	20	20	20	20	20	20	20	20	A9	C860:	45	4E	11	9D	9D	9D	9D	9D	19
C7B0:	20	20	20	20	20	20	20	20	B1	C868:	4D	4F	52	45	11	9D	9D	9D	86
C7B8:	20	A0	A0	A0	EA	A0	A0	A0	87	C870:	9D	52	4F	57	53	2E	00	81	0A
C7C0:	EA	A0	A0	A0	EA	A0	A0	A0	5A	C878:	53	4F	52	52	59	11	9D	9D	65
C7C8:	EA	A0	A0	A0	EA	20	20	20	E0	C880:	9D	9D	9D	41	42	4F	55	54	D5
C7D0:	20	20	20	20	20	20	20	20	D1	C888:	11	9D	9D	9D	9D	9D	59	4F	56
C7D8:	20	20	20	20	20	20	20	20	D9	C890:	55	52	11	9D	9D	9D	9D	42	02
C7E0:	20	EF	EF	EF	FA	EF	EF	EF	9B	C898:	55	52	4E	45	44	11	9D	9D	64
C7E8:	FA	EF	EF	EF	FA	EF	EF	EF	7E	C8A0:	9D	9D	9D	9D	46	4F	4F	54	50
C7F0:	FA	EF	EF	EF	FA	20	20	20	17	C8A8:	2E	11	9D	9D	9D	9D	9D	50	4C
C7F8:	20	20	20	20	20	20	20	0C	E5	C8B0:	52	45	53	53	11	9D	9D	9D	D8
C800:	05	06	14	12	0F	17	13	13	7D	C8B8:	9D	9D	42	55	54	54	4F	4E	D1
C808:	03	0F	12	05	9A	59	4F	55	C9	C8C0:	11	9D	9D	9D	9D	9D	9D	54	D7
C810:	20	48	41	56	45	11	9D	9D	A1	C8C8:	4F	20	50	4C	41	59	11	9D	1E
C818:	9D	9D	9D	9D	9D	9D	41	47	52	C8D0:	9D	9D	9D	9D	9D	9D	41	47	0B
C820:	49	4C	45	11	9D	9D	9D	9D	82	C8D8:	41	49	4E	2E	00	00	00	00	DF

AMIGA SECTION

Continued from page 61

Finally, after a specified time limit—or after two inactive minutes—*Diga!* Remote will log off the caller. It's not quite the "Revenge of the Amiga AnswerMate" but it comes pretty close.

One final feature of *Diga!* that deserves mention is its handling of the capture buffer. *Diga!*'s buffer is selectable not only in size (the default is 16K and can go up to 512K) but also in type of buffer. Aside from the normal "once it's full, it's full" mode, *Diga!* also supports a special Loop mode that replaces the oldest text with the newest. A View Buffer window can be opened for you to scroll back and forth through your captured text. The Buffer can also interchange text with Amiga's clipboard in either IFF text format or the popular TxEEd format. And for those times when you scream, "Oh, why oh why didn't I have my buffer open?" the buffer on-off switch can be set and saved as part of your opening configuration file.

As usual, one is never satisfied. One area that was overlooked in *Diga!*'s development is in the chatting or conferencing abilities. Several telecommunication programs have the capacity to open a "Chat Window" so that you can safely compose your words of wisdom, not to mention your snappy comebacks,



apart from the incoming text during conferencing. This feature is sorely missed and was possibly omitted because a majority of the development work on *Diga!* was performed on Bix, which has no real conferencing area. Whatever the reason, it is a must for *Diga!* 2.0.

There do seem to be a number of minor, and one not so minor, bugs associated with *Diga!* I have had the machine lockup (a hard-core lockup without even a smiling Guru) while trying varying combinations in the Screen Requestor. Other people have reported several other "quirky" bugs—ones that don't seem to be in the major flow of the program but rather stem from the many options one is presented with. However, my major complaint with *Diga!*'s operating is its inability to release the serial port upon exiting the program. If you then restart the program, you will receive a System Requestor that states the *Diga!* can't get the serial port. Very messy cleanup.

Unfortunately, I do have one more gripe—and it's a big one. I really find the documentation to be extremely lacking. Undocumented features are the rule here—which I suppose is better than having no features—and it is extremely frustrating. I wonder how many *Diga!* owners reading this review know that clicking on the word "Configuration" or "Script" in the Phonebook requestor would generate file requestors? Moreover, not enough detail is devoted to the more unique features of *Diga!* such as Doubletalk and Remote Access. No clue is given as to when you are to invoke DoubleTalk when receiving a call; DoubleTalk cannot auto-answer, but there's no way to know it without finding out rather rudely. Add to these specific complaints the lack of an index and you're doing a serious disservice to a great program. *Diga!* deserves better.

Happily though, the strengths of *Diga!* far outweigh its weaknesses and I can recommend this program to all levels of telecommunicators. From the first-timer who marvels when someone starts "typing" at him to the power-user whose entire telecommunicating life is scripted, *Diga!* speaks, and powerfully.

Aegis Development, 2210 Wilshire Blvd. #576, Santa Monica, CA 90403.

—Joseph Lowery

TIPS AHoy!

Continued from page 52

62,5

- 80 DATA 160,0,173,18,208,201,10,176,4,162,146
- 90 DATA 160,1,140,32,208,142,18,208,173,13,220
- 100 DATA 41,1,240,3,76,49,234,76,188,254

COLOR KEY

Here is a unique way of defining a function key that changes the color of the border.

```
KEY1,CHR$(27)+"J[7 "[INSERT]]"COLOR4,"+CHR$(13)
```

After defining the function key, position the cursor at the beginning of a blank line. Now, type the number 1 and hit the previously defined function key. Your border should now be black. This technique can also be used to load or save a BASIC program on disk. For a loading example, define a key with the following function:

```
KEY1,CHR$(27)+"J[6 "[INSERT]]"DLOAD"+CHR$(34)+CHR$(13)
```

Again, position the cursor at the beginning of a blank line. Type the name of a file that you would like to load. When doing so, just type the filename and no quotation marks. Hit your previously defined function key and your BASIC program is loaded into memory. —Michael Jaecks
Alamogordo, NM

EPROM TESTER

As a computer technician, I have found that the most annoying part of EPROM (Erasable Programmable Read-Only Memory) programming is the time spent in verifying that the chips are empty after erasure. In the past, I have written short BASIC programs to handle this function, but the waiting involved in checking thousands of memory locations for proper erasure is frustrating and time-consuming using BASIC programming alone.

Now, both experimenters and professionals can benefit from *EPROM Tester*. By using a short machine language subroutine within a BASIC program, EPROM memories can be checked with split-second speed.

To use this program, LOAD your EPROM data directly

into the Commodore 64 RAM (or C-128 in 64 mode) following the instructions provided by the manufacturer of your EPROM programmer. A restriction to this is that you should not load below address 3500 decimal. Then LOAD and RUN this program in the normal BASIC program area. You will be prompted to input a decimal start and ending location in RAM, which will be tested for proper erasure (255 decimal, or FF hex). Almost instantly, the results will be displayed on the screen. Locations not properly erased will be shown with an error message. The machine language portion is fully relocatable in case you need to move it elsewhere in memory.

I hope you will enjoy using this program as much as I do when working with EPROMs. —David S. Krause
Grissom AFB, IN

- 10 REM EPROM TESTER
- 20 REM BY DAVID S. KRAUSE
- 30 FORX=3400TO3450:READY:POKEX,Y:NEXT:PRINT"[CLEAR]"
- 40 PRINT"[DOWN][DOWN](LOAD EPROM AT OR ABOVE 3500 DECIMAL)"
- 50 INPUT"[DOWN][DOWN]EPROM START ADDRESS":S\$
- 60 INPUT"[DOWN][DOWN]EPROM ENDING ADDRESS":E\$
- 70 S=VAL(S\$):E=VAL(E\$):A=INT(S/256):B=(S/256-A)*256
- 80 C=INT(E/256):D=(E/256-C)*256
- 90 IFS>ETHENPRINT"[DOWN][DOWN](ERROR-START CANNOT BE GREATER THAN END ADDRESS)":GOTO50
- 100 POKE251,B:POKE252,A:POKE253,D:POKE254,C
- 110 SYS3400
- 120 IFPEEK(2)=7THENPRINT"[CLEAR]SPECIFIED ADDRESSES ARE FULLY ERASED"
- 130 IFPEEK(2)=33THENPRINT"[CLEAR]ERROR IN ADDRESS":PRINTPEEK(251)+256*PEEK(252)
- 140 END
- 150 DATA120,160,0,177,251,201,255,208,26
- 160 DATA165,252,197,254,208,12,165,251,197,253,208,6,169,7,133,2,88,96
- 170 DATA160,0,177,251,201,255,240,6,169,33,133,2,88,96,230,251,208,208,230
- 180 DATA252,208,204,88,96

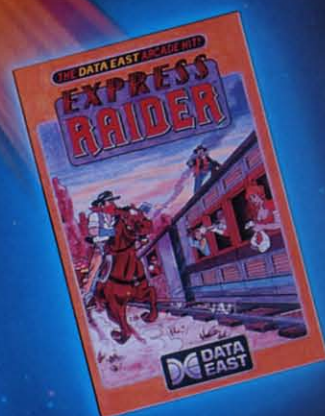
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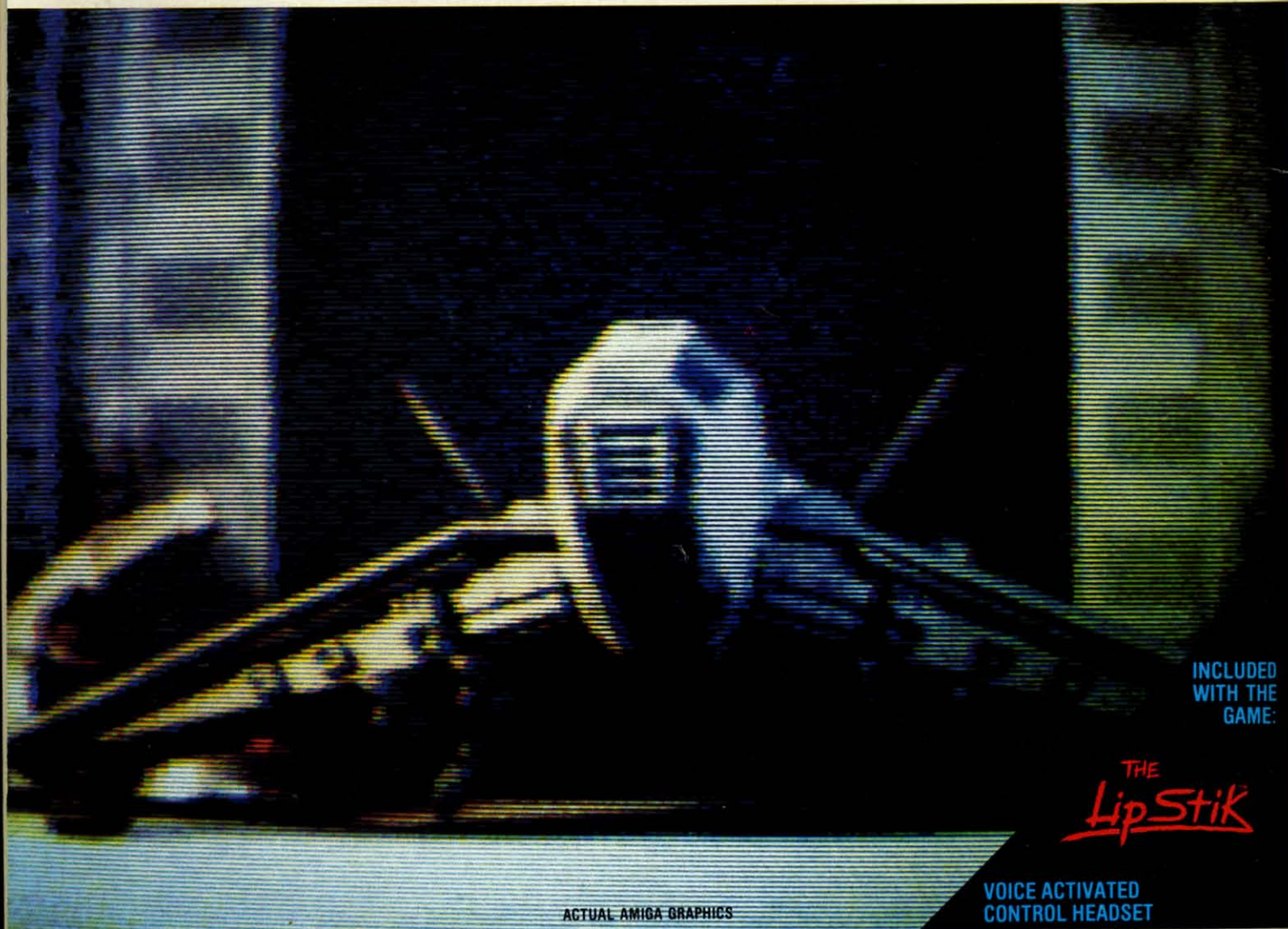
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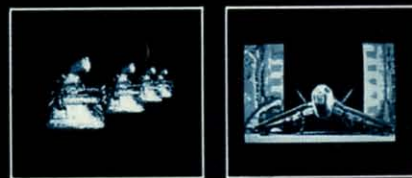
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